THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
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Foundrymen's Convention in Philadelphia

Thirty-Second Annual Meeting and Twenty-First Foundry Machine and Equipment Exhibition Will Be Held at the Commercial Museum, May 14 to 18

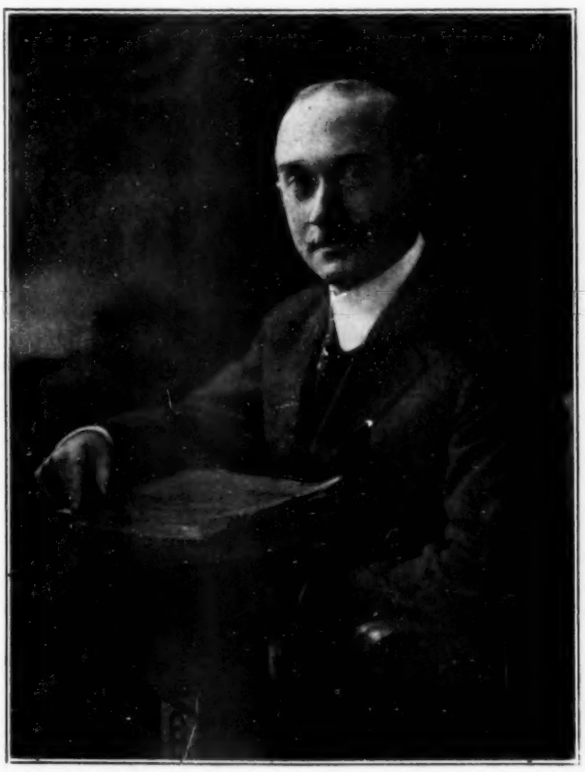
By WILLIAM WARD
Philadelphia, Pa.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Philadelphia, the scene of the first national convention of the American Foundrymen's Association in 1896, is to be the site of the thirty-second annual gathering together with the twenty-first foundry machine and equipment exhibit from May 14th to the 18th. The Philadelphia Commercial Museum, one of the most noted exhibition halls in the country, will be the scene of the machinery and equipment exhibit, while convention headquarters will be at the Bellevue-Stratford Hotel where plenty of room has been reserved for the officials, national and local, of the convention. To provide for the comfort of the delegates and others attending, suites have been reserved, entire floors in some instances, in other hotels nearby.

A local committee and its sub-divisions have been actively at work on arrangements and matters have been advanced so far that the busy chairman of sub-committees can sit back for a time and breathe easily, in the knowledge that all is shipshape. Everything points to the belief that the convention will be the biggest and best ever held.

The coming convention will be the fourth that the Foundrymen's Association has held in this city. The second was held in 1907, the third in 1919. Organized in 1891, the Association really had its first national session here in 1896 and according to Howard Evans, veteran secretary of the local association, this gathering really marked the beginning of the American Foundrymen's Association.



G. H. CLAMER,
Chairman, General Committee

PHILADELPHIA AS A CONVENTION CITY

Philadelphia has long been known as the ideal convention city of America. Its history is too well known to have to repeat here. It is convenient of access, and has plenty of hotel accommodations. From the angle of the golfer it is also desirable for it is filled with fine courses and there are any number of excellent country clubs in the city itself or within a short radius in the suburbs. As many of the delegates and others who will attend are golf addicts and plan to combine business and sport, this fact has been recognized and the golf committee is planning some interesting events.

Aside from the convention itself and the entertainment to be provided, both for the men and their ladies, there is much in Philadelphia to interest the visitors. There is Independence Hall, scene of the signing of the Declaration of Independence; the home of Betsy Ross where the first Stars and Stripes was made; the old Carpenters Hall, scene of the meetings of the Continental Congress, and

many other historic shrines of American Independence. Not far away is Valley Forge, scene of the sufferings of Washington and his men during the terrible winter of 1778, and now a beautiful and historic park with some of the huts of the Continentals still standing, and the site of a $2,000,000 memorial cathedral to Washington and his men. There are scores of other interesting places for visitors and many of the battlefields of the Revolution are not far away, some even being within the present city limits.

FACILITIES FOR EXHIBITS

The convention sessions and the exhibition will be well housed. The Commercial Museum, conducted under private auspices, is a gigantic research bureau for trade, commerce and industry and it has a wonderful exhibition itself in minerals, products and examples of customs from every land in the globe. The convention hall is a large building separate from the Museum headquarters and is the largest one room hall of the kind in the country, if not in the world. As it is, indications are now that every available foot of floor space will be taken up by the exhibits. More than 100 carloads of exhibit material already are assured and every bit of space available has been contracted for. To add to the efficiency of the exhibits, the Philadelphia Electric Company is to run special power lines from its huge hydro-electric power plant at Conowingo, Md., for the exhibition.

Some idea of what the attendance at the coming convention will be is indicated by the figures of the Detroit convention in 1926. The registration there was 5,732 men representing 2,320 firms, almost 5,000 of them coming from outside the Detroit district. With the large number of foundry and allied operations in and about the city, it is expected by the committee that the registration number for the convention here will far exceed that at Detroit or at Chicago last year.

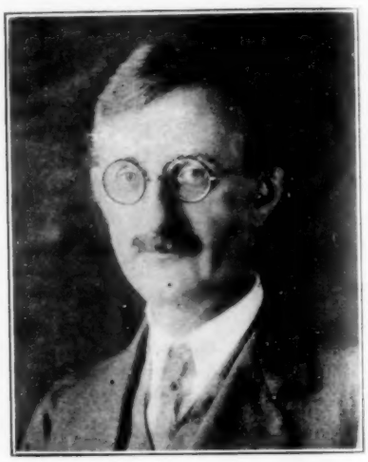
Philadelphia is essentially an industrial city and a diversified one. Originally an almost purely commercial town, its character has changed materially since the discovery of the huge coal and iron deposits in Pennsylvania and its industrial rank has for many years far advanced over that of its commercial activities, although its port is one of the best in the United States.

The city is the home of countless manufactures, some of world fame. The Baldwin Locomotive Works, the Cramp Company plants, Atwater Kent Company, and in adjacent cities, the huge shipbuilding plants, in many of which the foundry plays an important part, as well as a large number of brass foundries, aluminum and bronze will be accessible to the visitors. A special program of tours has been arranged by the local plant visitation committee and scheduled in such fashion as not to interfere with attendance at the interesting sessions of the convention.

Philadelphia foundrymen have been active for some time perfecting arrangements for the convention and energetic members of the general and sub-committees are to leave nothing undone for the well being, entertainment and education of all visitors. As an instance of what is being arranged it may be said that T. H. Addie, of the American Manganese Bronze Company, is chairman of the golf committee and to those who know Mr. Addie, it is needless to add that the comfort of the golfers will be looked after in a most complete way. Arrangements already have been made by which the finest links in this section will be open to the foundrymen.

B. H. JOHNSON.
Chairman Plant Visitation Committee

FREDERICK M. DEVLIN.
Chairman Entertainment Committee



J. A. DAVIES.
Chairman Hotels Committee

CONVENTION ACTIVITIES

As for the general program of the convention, it includes a large number of matters of vital interest to every foundryman. One of the most interesting subjects to be discussed will be the apprentice problem, which is regarded as likely to be one of the high spots of the sessions. The morning session of Thursday, May 17 will be devoted, under the chairmanship of Earl S. Sparks, executive secretary of the Metal Manufacturers' Association of Philadelphia, to a symposium and discussion of adequate methods to maintain a full complement of skilled men. H. A. Fromelt, of Milwaukee, Chairman of the Apprentice Section of the American Foundry Association, will be active in this feature of the convention.

Still another interesting feature of the day will be the apprentice contests in which exhibits of the best work of apprentices all over the country will be shown. These will be judged for neatness, refinement and proficiency. First prize carries a $50 wrist watch, the second is $25 in cash and the third $10, together with engraved certificates of merit from the American Foundrymen's Association.

The convention will open Monday at headquarters in the Bellevue-Stratford Hotel with registration of delegates and visitors and meetings of committees. Tuesday will be devoted to the opening meeting, organization and a business session. In the afternoon Foundry Costs will be the subject for discussion

A round table discussion on the problems of brass founding will also be held in the afternoon.

The task of arranging suitable entertainment for the wives, daughters and other feminine relatives of the delegates is in the capable hands of Ralph Belleville and his associates and the ladies can be assured of a number of interesting programs while the men folks are talking or playing golf.

C. F. Hopkins, vice-president of the Ajax Metal Company, is at the head of the local finance committee, and is not worrying yet a bit over his job. "Philadelphia foundrymen will come through all right, once they know how much is needed," he said.

The Chairmen of the Philadelphia committees are as follows:

G. H. Clamer, The Ajax Metal Company, Frankford Ave. and Richmond St., General Committee.

T. H. Addie, American Manganese Bronze Company, Holmesburg, Phila., Pa., Golf Committee.

Ralph Belleville, Joseph Dixon Crucible Company, 612 Public Ledger Bldg., Philadelphia, Pa. Ladies' Entertainment Committee.

J. A. Davies, Westinghouse Electric & Manufacturing Company, Lester Branch P. O., Philadelphia, Pa., Hotel Committee.

Frederick M. Devlin, Philadelphia Hardware & Malleable Iron Works, 9th & Jefferson Sts., Philadelphia, Pa., Entertainment Committee.

C. F. Hopkins, The Ajax Metal Company, Frankford Ave. & Richmond St., Philadelphia, Pa., Finance Committee.

B. H. Johnson, Cresson-Morris Company, 18th St. & Allegheny Ave., Philadelphia, Pa., Plant Visitation Committee.

Walter L. Kalbach, 12th & Olive Streets, Philadelphia, Pa., Chairman, Transportation Committee.

Laird U. Park, Park & Williams, Inc., Real Estate Trust Bldg., Philadelphia, Pa., Reception Committee.

Earl S. Sparks, Metal Manufacturers' Association of Philadelphia, 1623 Sansom St., Philadelphia, Pa., Publicity Committee.

C. H. HOYT.
Executive Secretary-Treasurer of the American Foundrymen's Association

PHILADELPHIA METAL PLANTS

One of the distinctive plants on the visitation committee list is that of the Sheeler-Hemsher Company at 913 Fairmont Avenue which for 26 years has been one of the outstanding concerns in the casting of brass, bronze, copper and aluminum. In aluminum it makes full faced castings, which are like die castings and its work embraces practically everything in the casting line in these metals. Mr. Sheeler is one of the active members in the local association and has been busy for some time on two of the sub-committees on arrangements for the convention.

The Charles Perkes Company, brass founders at 627 Arch Street, is one of the pioneer plants of this kind in the city, having been established in 1856. It turns out brass pipe fittings of every kind.

Other important concerns that will be visited are the plants of Paul S. Reeves & Son, at Broad and Catherine Streets; William Sellers & Company, 1600 Hamilton Street and Cramp Brothers Foundry at Thompson and Cedar Streets, of which L. H. Taylor is the president.

The list of foundries in Philadelphia is a long one and include the following: Acme Brass Foundry, 4317 North American Street; Adelphia Manufacturing & Plating Company, Orthodox and East Belgrade Street; Caskey's Brass and Bronze Works, York and Richmond Streets; Central Bronze and Brass Factory, 714 Cherry

Tentative Program—Technical Papers and Reports on Metals

MONDAY, MAY 14

REGISTRATION

COMMITTEE MEETINGS

TUESDAY, MAY 15

SESSION 1—GENERAL OPENING MEETING AND BUSINESS SESSION

SESSION 2—NON-FERROUS METAL FOUNDING

Furnace Refractories for Brass Foundries—H. M. St. John, Detroit Lubricator Company, Detroit.

Science in the Foundry—E. F. Hess, Ohio Injector Company, Wadsworth, Ohio.

Risers, Their Need and Feeding—R. R. Clarke, Alloy Foundry, General Electric Company, Erie, Pa.

Casting Nickel-Copper Alloys—Representative of Caskey's Brass and Bronze Works, Philadelphia, Pa.

SESSION 5—FOUNDRY COSTS

Report of **Committee on Foundry Costs. Necessity for Creating a Castings Consciousness**—A. F. Jensen, The Hanna Engineering Works, Chicago.

The Schedule Fallacy—J. J. Ewens, The Geo. H. Smith Steel Casting Company, Milwaukee, Wis.

WEDNESDAY, MAY 16

SESSION 8—ROUND TABLE

Discussion of **Brass Foundry Problems.**

SESSION 9—FOUNDRY MANAGEMENT

Basic Principles of Management in the Foundry—J. D. Towne, Consulting Engineer, Dayton, Ohio.

Stabilizing Labor and Cutting Costs—A. D. Lynch, Director of Personnel, Ohio Brass Company, Mansfield, Ohio.

What Does the Buyer Expect for His Money—J. A. Marks, Purchasing Manager, Packard Motor Car Company, Detroit, Mich.

A Contribution to the Training of Labor and the Personnel of a Foundry—A. Soupart, Director of Professional Museum of the State and of the Technical School of Morlanwetz, Belgium. Exchange Paper of the Belgium Foundry Technical Association.

THURSDAY, MAY 17

SESSION 11—APPRENTICE TRAINING

Review of Surveys of Apprentice Training in Local Foundry Centers.

FRIDAY, MAY 18

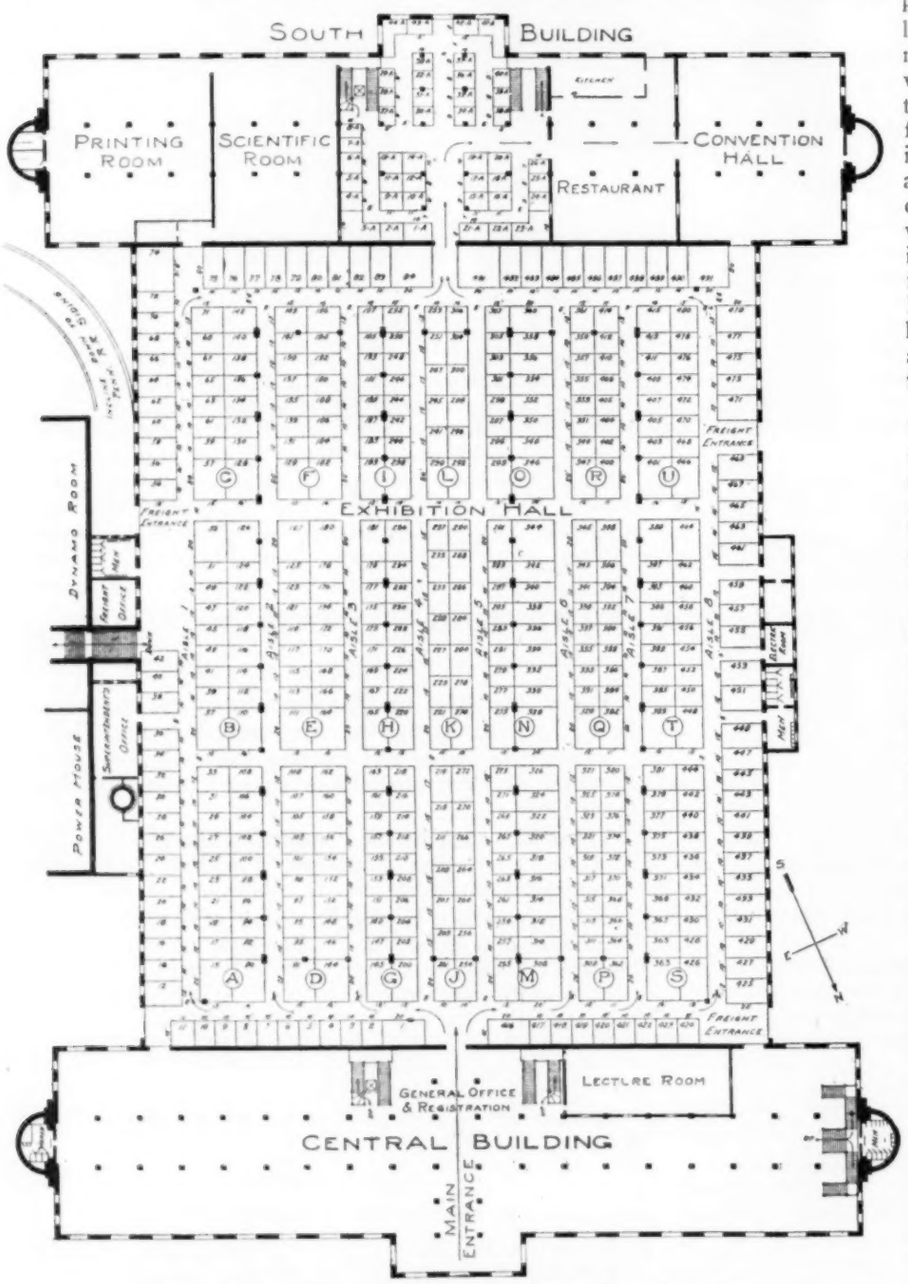
SESSION 14—MATERIALS HANDLING

Materials Handling and Its Relationship to Building Plans—E. F. Scott, The Austin Company, Cleveland, Ohio.

Street; Cramp Brass and Iron Foundries Company, Richmond and Norris Streets; Enterprise Brass Foundry, East Girard and Aramingo Avenues; Huxley Bronze Casting Company, and Huxley Foundry, 106 Tasker Street; Modern Brass Foundry Company, 315 North 20th Street; North Philadelphia Brass Foundry, 4415 North Philip Street; Northern Bronze Corporation, 4212 Cresson Street; Pennsylvania Bronze and Brass Company, Inc., 22nd and Master Streets; Ridgeway Brass Foundry, 1394 Lemon Street; U. S. Metallic Packing Company, 429 North Thirteenth Street.

Concerns that specialize in bronze production include: American Manganese Bronze Company at Rhawn and Hegerman Streets; Bronze Memorial Tablets Company, Westmoreland and 23rd Streets; Damascus Bronze Company, Finance Building; Extruded Metal Products Company, 1524 Sansom Street; Federal Brass and Bronze Company, Flanders Building; Gorham Company, 1505 Arch Street; Newman Manufacturing Company, 1823 Brandywine Avenue; Ornamental Bronze and Iron Company, 305 North 15th Street; Phosphor Bronze Smelting Company, 2200 Washington Avenue; Superb Bronze and Iron Company, 1600 Walnut Street; Wheeling Bronze Casting Company, Inc., 1524 Sansom Street; Shannon Metalcraft Corporation, 11 Letitia Street; Wright Manufacturing Company, Inc., 131 Master Street; Girard Smelting & Refining Company, Richmond and Tioga Streets.

The Ajax Metal Company at Richmond and Frankford Streets was founded in 1880 by Francis J. Clamer and Joseph G. Hendrickson for the purpose of producing and marketing a bearing alloy consisting of copper, tin and lead for making car, locomotive and machinery bearings. Later on the Company started on a large scale the manufacture of car journal bearings and the wearing parts of locomotives as well as white metal alloys of all kinds. During the years that followed there was developed a demand for ingot metals of a large variety of formulæ and this grew to such proportions that the manufacture of car and locomotive bearings was discontinued five years ago in order to devote the full capacity of the plant to ingot and white metal alloys so that today it is meeting the demand for over four hundred different formulæ. Radical changes and additions have been made in the past year and $250,000 have been spent in thoroughly modernizing the plant.



PLAN OF FOUNDRY, MACHINE AND EQUIPMENT EXHIBIT, AMERICAN FOUNDRYMEN'S ASSOCIATION

Some years ago the Ajax-Wyatt Electric Furnace of the induction type was invented for melting yellow brass and other non-ferrous alloys. This business has grown extensively and a separate plant is devoted to the manufacture of these furnaces.

Later on another furnace of the high frequency induction type called the Ajax-Northrup Furnace was invented and a subsidiary company was started at Ajax Park near Trenton, N. J., called the Ajax Electrothermic Corporation for the manufacture of this type of furnace. This furnace is in successful use for a large variety of purposes.

After the death of the Company's first President—Joseph G. Hendrickson—J. R. Neilson succeeded him as President. In January, 1924, G. H. Clamer, son of Francis J. Clamer, one of the founders of the company, succeeded to the presidency, which position he now holds.

Mr. Clamer is the inventor of the Ajax Plastic Bronze—a high lead bronze for bearings—which has since become famous and this alloy is in extensive use throughout the world for bearings. Mr. Clamer is well known in the metallurgical, foundry and electrical world. He patented a

refining process for which he was awarded the Elliott-Cresson Gold Medal of the Franklin Institute, the then highest award of the Institute. He is past President of The American Institute of Metals, The American Society for Testing Materials and the American Foundrymen's Association.

The American Manganese Bronze Company is one of the largest bronze foundries in the country. It is located in the northeastern section of the city, at Holmesburg Junction on the New York division of the Pennsylvania Railroad. The plant is equipped for the heaviest type of castings, two 15-ton cranes with plenty of head-room in the main foundry bay; a melting capacity of thirty-five tons a day; and heavy equipment throughout. Propellers for ships comprise a large part of the output. Some of them are nearly twenty feet in diameter, and weigh as much as 30,000 pounds. Water turbine wheels, large valves, hydraulic equipment, and non-corrosive castings for the chemical industries are also large items amongst their products. Their Hy-ten-sl bronze is well known and their output probably covers more than a hundred different alloys, from soft bearing metals and acid-resisting alloys to hard, non-corrosive structural bronzes. A comparatively new line in this plant is the manufacture of brass pipe fittings for the plumbing trade. Three thousand to five thousand fittings a day are being turned out, tapped and hydraulically tested, ready to install. A separate department for this line, equipped with modern molding machines, pipe tapping machines, grinding and testing equipment, is in constant operation.

The Cramp Brass and Iron Founderies were formerly a part of the William Cramp & Sons Ship & Engine Building Company. Recently this company sold its shipyards and confined itself to industrial and power work. A full description of the brass foundries appeared in THE METAL INDUSTRY for January, 1927. These foundries specialize in large and difficult work such as propellers, turbine rotors, special alloys, etc. The plant is said to be one of the largest and best equipped in the United States.

Move Foundrymen's Headquarters

Headquarters of the American Foundrymen's Association were moved on April 10 from 140 South Dearborn street to the Adams Franklin building, 222 West Adams street, Chicago, Ill., where larger quarters have been obtained.

After the convention at Philadelphia the office of the technical secretary will be moved from 909 West California street, Urbana, Ill., to the new headquarters in Chicago.

New Carillon Clock for University of Louvain

Engineering Societies Sponsor $80,000 Memorial to Engineers Who Gave Lives for Defense of Freedom

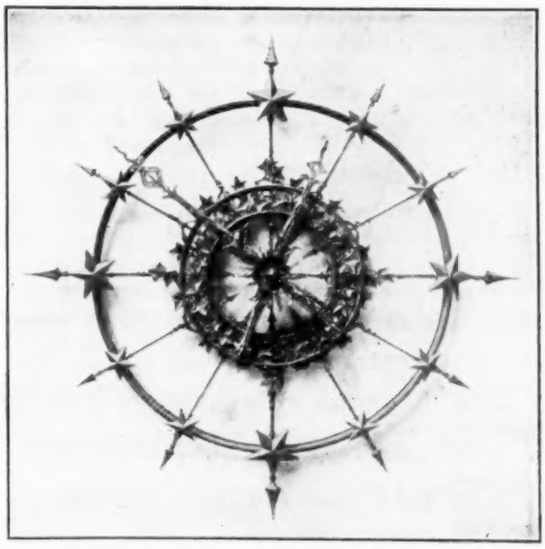
Artisans of France, England, and America, the Engineering Foundation announces, are fashioning the huge four-dial clock and the three-octave carillon of thirty-six bells for the tower of the new library of the University of Louvain, which will be dedicated on July 4, 1928.

The dedicatory ceremonies, to be attended by statesmen, educators, diplomats, and engineers from many nations, including an engineering delegation from the United States, will celebrate both the American Declaration of Independence and the complete restoration of the historic library destroyed during the World War.

The clock and carillon are being given, at a cost of $80,000, by American engineering societies "as a memorial to the hundreds of engineers of this country who gave their lives for the defense of freedom, 1914-1918."

The works of the clock, which will be placed about 140 feet above the street level, are being made in Croydon, England, where tower clocks have been fabricated for nearly a century. The works will be very accurately and strongly built, so as to keep good time, A. D. Flinn, Director of the Engineering Foundation, says. The various parts will be of steel, gun metal, iron, and phosphor bronze, according to the mechanical necessities.

The clock will have four dials of special design. The dials and hands are being constructed by ornamental wrought iron makers of Paris, New York, and London. The hands will be completely covered with gold leaf, not only for ornament but to increase their visibility even in dim light at night. The ring of each clock dial will be fifteen feet in diameter. The spear tips will be covered with gold leaf. The twelve stars on each dial, the whole forty-eight representing the states of the Union, will be made of aluminum bronze, ninety-two parts copper, eight parts aluminum, contributed by the American Brass Company, Waterbury, Conn., through its technical superintendent and metallurgist, William H. Bassett, who is a vice-president of the American Institute of Mining and Metallurgical Engineers. From these sheets of aluminum bronze, stars are being fabricated under the personal supervision of Colonel Arthur S. Dwight, formerly of the Eleventh Engineers, organized in New York City, and a member of the War Memorial Committee of the American engineering societies. The work is being done in the shops of the Dwight and Lloyd Sintering Companies, Stanhope, N. J.



DIAL OF CARILLON CLOCK

The clock will chime each quarter hour upon six large bells of the carillon and strike the hours upon the Bourdon, or great bell, weighing eight tons.

Practical Solutions of Foundry Problems

By WILLIAM J. REARDON
Foundry Editor

LEAKS IN BRASS VALVE CASTING

Q.—In casting the valve body as shown in the accompanying diagrams, we are having trouble from leaks which we find upon putting the valves under pressure. As shown in Fig. 1, the valve body is cast in a solid

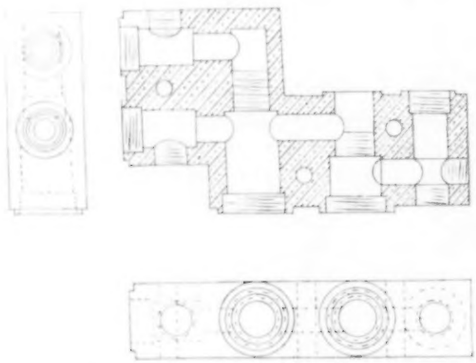


FIG. 1—METHOD OF CASTING IN SOLID BLOCK

block. In Fig. 2 we show the gating method and indicate the places where leaks occurred. The riser shown is about twice as heavy as the casting; the casting weighs

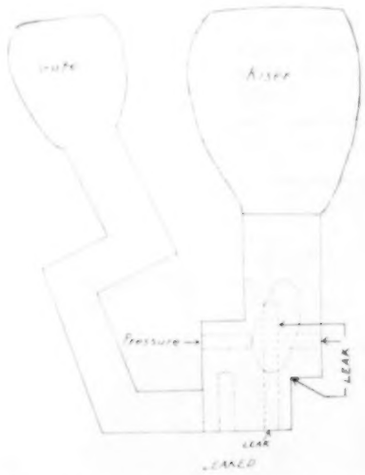


FIG. 2—GATE AND RISER WITH DRILL HOLES WHERE LEAKS OCCURRED

about 22 lbs. The metals we have tried are of the following three mixtures:

No. 1—90 Lake copper, 6 tin, 3 horsehead zinc, 1 St. Joe lead.

No. 2—87 Lake copper, 10 tin, 2 horsehead zinc, 1 St. Joe lead.

No. 3—88½ Lake copper, 4½ tin, 4½ horsehead zinc, 2½ St. Joe lead.

We obtained the best results from our No. 3 mixture. what sort of mixture would you suggest? Is there any other method of casting that might obviate our leakage trouble? We first melt up the mixture and cast into ingots, then melt again and pour the casting at 2000° to 2100° F. Melting is done with a charcoal covering.

A.—We suggest you use a chill in casting this valve body. Place a chill made of 90 copper and 10 aluminum on the sides of the castings and gate at the bottom, as you are now doing. You can cut the riser down somewhat, and you can use any mixture you desire. We suggest your No. 2.

Your trouble is due to segregation and the chill will eliminate your trouble. Make this chill 1½ in. thick and if there are any offsets on the outside of pattern, make a chill of plaster of Paris to fit the pattern. However, a chill on the flat side will be sufficient. The idea of the chill is to set the metal and quickly stop segregation.

We are of the opinion that casting them solid is the best way. Do not put anything on the chill, only black lead with a cloth dipped in lard oil and rub dry. Leave mold open until pouring time.

ACID-FUME-RESISTING CASTINGS

Q.—We have an order for several hundred pounds of heavy bracket castings to be used in a hot sulphuric acid bath. The castings used at the present time apparently resist the acid proper but do not resist the fumes. The lower part of the casting that is constantly submerged does not show deterioration, but the part that is not submerged is almost entirely eaten away in less than three months' time. What would you suggest we use for making castings?

A.—We suggest the use of aluminum bronze for this work. This metal is composed of 90 copper and 10 aluminum. This material is used in sulphuric acid pickling vats and is the most satisfactory alloy we know of. It is highly resistant to the action of a wide range of corrosives.

It is rather difficult to produce first class castings from this alloy if you have not had some erperience with it. A suitable flux should be used to help secure good castings. We suggest you use one half of one per cent of a 30% manganese copper as a flux; it will help. If you can overcome the difficulty of casting you will find this alloy satisfactory. If the manganese copper will not deoxidize the alloy properly, there is another flux. We can send you the name of the maker if you find you need it. However, if you use the same method of molding you would use in operations with manganese bronze and the manganese copper, we believe that you should get satisfactory results.

WHITE BRONZE

Q.—Kindly advise if you can refer us to a formula for white bronze? We are planning to make up some small caster wheels and would like to have a white mixture using a copper base that would not be too expensive. Any information you can let us have on this would be very much appreciated.

A.—We suggest for this class of work a mixture of 55 copper, 12 nickel, 5 lead, 27 zinc, and 1 aluminum; or buy German silver scrap and add ½ per cent of aluminum and 4½ per cent lead.

This mixture will answer your purpose.

The Fundamentals of Brass Foundry Practice

A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Work*—Part 16

By R. R. CLARKE
Foundry Superintendent

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

GATING AND FEEDING THE CASTING

Gates are the openings through which metal either enters the casting mold or exercises some control over it. They are, therefore, instruments of control and media of transmission. This control extends to a number of objectives. It may operate against shrinkage, it may function to the relief of strain, it may assist against the effect of a "gassing" core, it may lend to the purging of metal of its dirt and dross, it may check against the violence of current, etc. These identify only a few of the many instances where the gate functions quite independently of delivering metal to the casting and partly or exclusively in its capacity of control. This broad classification of transmission and control is the first to suggest itself naturally.

Another natural and broad distinction of gates derives from their directions of flow or lead regarding the casting. Some flow toward and into the casting; others, from, out and away from the casting. Still others away from and clear of the casting altogether. These in order might be termed gates of ingress, gates of egress and gates of independent lead.

NOMENCLATURE FOR GATES

Every composite gate consists of a number of integral parts or units such as sprue, button, runner, branch, etc. A rather chaotic condition today is the naming of these parts to distinguish them clearly from each other. Practice is common to refer to the composite make-up as "the gate" and it is none the less prevalent to designate each part by the same broad term. To clarify the situation this discussion will stick to the general term "gate" and use qualifying words to designate the integral part referred to. By this nomenclature the following gates briefly defined appear.

1. **Pressure Gate**—upward extention of sprue above cope height realized by means of cup or gate upset used to get greater height and pressure of metal without increasing flask height.
2. **Pouring Gate**—cone shaped upper terminus of pour-sprue in either cope flask sand or runner box or cup.
3. **Sprue Gate**—gate used to drop metal vertically downward.
4. **Pouring Sprue**—sprue gate occuring between pouring gate and first mold parting.
5. **Drop Sprue Gate**—gate used to drop metal downward through some part of mold other than the cope.
6. **Connecting Gate**—horizontal gate joining pouring sprue with drop sprue gate or connecting two drop sprue gates.
7. **Button Gate**—bowl shaped basin at bottom of pouring sprue or drop sprue.
8. **Main Runner Gate**—gate leading from pouring sprue to point of direct or indirect connection with the casting.
9. **Branch Gate**—gate from main runner to other points of mold but not connecting directly with casting.
10. **Delivery Gate**—ingress gate connecting main runner or branch with casting.
11. **Horn Gate**—gate resembling a horn; delivery gate leading to some point of mold not otherwise accessible.
12. **Underflow gate**—modified form of horn gate bringing metal up from under casting into casting.
13. **Overflow Gate**—gate used to carry off metal circulating through the mold.
14. **Relief Gate**—egress gate relieving casting of pouring strain.
15. **Rain Gate**—gate "showering" metal into a casting as through a perforated core.
16. **Riser Gate**—egress gate coiling from the casting to some point above it.
17. **Feed Gate**—gate used to feed casting against the tolls of shrinkage.
18. **Bottom Gate**—gate delivering metal to bottom or some lower portion of casting.
19. **Pouring Head Gate**—known also as runner box; enlarged box-like cavity built over pouring sprue gate to facilitate pouring and obtain cleaner delivered metal.
20. **Drop Pouring Gate**—pouring head gate filled up with stopper core to be lifted after box cavity is filled with metal; a means of delivering metal with maximum speed and cleanliness.

As before stated the main object of this nomenclature of gates is to facilitate discussion and to make the references clearer and distinctive.

THE 3 R'S OF GATING

The gating and feeding of castings are among the most critical phases of molding. In no detail is physical law more assertive and exacting. The very slightness of difference in form, volume, dimensions, etc., of gates resulting in great changes in results is indeed impressive. A pressure gate eight inches above the casting and kept filled in pouring may cause no damage. A half-inch of added height may make for ruin. A delivery gate approximating a semi-circle in section may render a good casting; flattened out the least bit it may yield a defective casting.

The subject is many sided indeed, including many phases and endless details. To cover the more important of these logically and in sequence is the most we can hope for.

All gating of castings has one or more of three distinct objects in view: (1) to run the casting cleanly; (2) to feed or replenish the casting and (3) to relieve the casting. Running, replenishing and relieving might well be said to be the three R's of gating. In running the casting many particulars bob up to engage judgment. First of all is

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the question, "Where or at what point or points should it be gated for its best and safest running possibilities?" No universal rule can be given since every casting or type of casting is practically a law unto itself in this respect. In a general way it might be stated that every casting should be gated for running where the metal action is least harmful; where the feeding is most favorable or the guarantee against drawing most stable; where the inflow is to greatest advantage in filling the mold, and where the zoning of different metal temperatures at pouring finish best serves the different casting sections.

To illustrate in order, wherever possible avoid gating:

1. Against a weak mold section, or to a deep drop of metal in the mold, or to running a great volume of metal over a given sand surface.
2. Into a casting section that will possibly solidify simultaneously with the delivery gate.
3. Into a heavy section adjoining a thin expansive section that might fail to run from this heavy section.
4. Into a bulky section adjoining a slightly less bulky section that ought to have the slightly hotter metal at pouring finish.

GATING A VALVE STEM

A common valve stem as per Figure 55 will illustrate this zoning phase. We have as possibilities the three points A-B-C at which to gate. Assuming that gate to

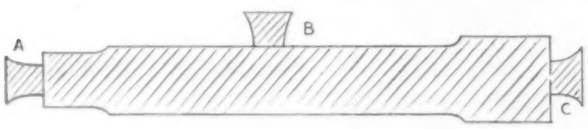

FIG. 55—GATING A VALVE STEM CASTING

be medium sized and identical at the three points the following appears: Gates at "A," metal at opposite; heavy end "C" is colder at pouring finish, timing its solidification more nearly with the lighter gated end "A" than would be the case if the order were reversed (i.e.—Y gated at "C"). Moreover a properly sized gate at "A," transferred to "C" would invite a pin hole in that heavier section. By gating at "B" middle point, we encounter the double pull of metal on the gate and the more equal temperature of final metal throughout besides transferring any gate marking that might develop to a very particular section of the casting. Practice has shown that regarding quality and economy, combined "A" has preferance, "C" comes next while "B" is least desirable. Incidentally a properly sized gate at "C" will take care of the situation admirably though such a gate is necessarily larger and more expensive than a correct gate at "A."

Very often a desirable running point is not an efficient feeding point in a casting and vice-versa. In such cases the better plan is to gate for running at the one point, for feeding at the other with separate gates and if necessary separate pouring as well. This illustrates in Figure 56 representing thin and heavy sections. If we gate at the top at "M" we get a drop and hard smash of metal at the heavy section bottom, besides engaging the possibility

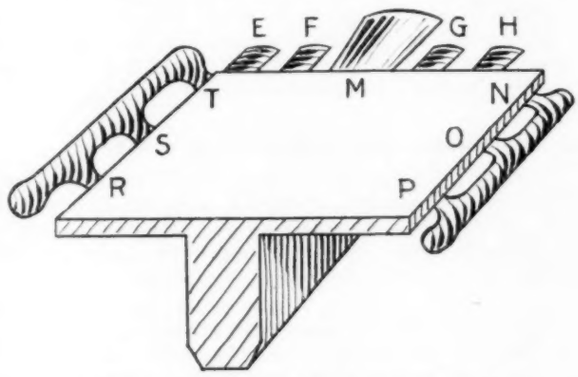

FIG. 56—GATING A THIN AND HEAVY SECTION

of misrunning the three sections. By bottom gating directly under "M" we get the same misrunning chance and have hottest metal at bottom of the heavy section which from a standpoint of shrinkage is not altogether logical. Gating singly, as at "W" or "S," a lone section of sand suffers long and intense metal action. By multiple gating at one side only as at "N-O-P" we neglect the opposite side "R-S-T" by furnishing to it cold and delayed metal. By gating either singly or in multiple at either end as "E-F-G-H," a long distance of flow results and a spreading out or partitioning effect in metal reaching the heavy section. Multiple gating and pouring from both ends accords a fair condition for a safe result. The only detracting factor being spreading out and partitioning of metal. If we double pour through multiple gates on the sides as "N-O-P" and "R-S-T" and place heavy feeders at opposite ends as at "M" we set up a logical condition for satisfactorily running and feeding the casting.

Where to gate a casting always represents a study which should always be made from the pattern and its core compliment. It is a mark of ability in any molder to go over his pattern and its mold conditions, carefully reasoning out his methods and practices in full before starting the job. He is then prepared to go ahead with his gating and other details in a logical and intelligent manner.

This article will be continued in an early issue.—Ed.

Monotype Metal

Q.—As a subscriber to your METAL INDUSTRY I would appreciate an answer to the following question. We are casting type on a monotype machine using type metal containing 20 per cent of copper. Although operating conditions are as specified by the manufacturer of the machine, we cannot eliminate tiny air holes in the type. These holes while not visible to the naked eye are very prominent under the microscope. Other types are not so pitted. Could you suggest an alloy which could be put in combination with the type metal to eliminate this difficulty? We know that it is being done.

A.—There must be some mistake in the amount of copper in your monotype metal mixture. We do not think you could cast a mixture with 20 per cent copper. You may possibly mean .20 copper and even this would be too high. A good monotype metal should not contain over .04 copper; in fact free from copper is a better mixture; 10 tin, 18 per cent antimony and balance lead would be very satisfactory mixture for use on a monotype casting machine.

We suggest you get in touch with some good reliable smelter in your locality and he will instruct you in the different alloys suitable for your work. It is cheaper to buy the metal alloyed from the smelter and if any trouble occurs he is more than willing to help you out and correct it.—W. J. REARDON.

Welding Aluminum Castings

A Practical Description of the Work Involved in This Difficult Process

By WILLIAM MASON
Liverpool, England

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Before attempting to weld aluminum castings, it is first of all necessary that the edges of the surface around the breaks be made scrupulously clean; otherwise the impurities which may remain will set up disintegration of the weld, and ultimately it will fail. In the case of oily castings the work should be heated with a blow-pipe or blow-lamp flame until the oil is burned from the surface. In aluminum castings oily and fatty matter is often retained by the metal in considerable quantity owing to its porosity. Should a weld be effected before the oil is expelled, the oil will cartonize and adhere to the edges of the work, thus impeding cohesion of the two surfaces to be united. A wire brush makes an excellent cleaning tool for aluminum castings.

Aluminum or aluminum alloy castings up to ¼ in. in thickness can be welded without bevelling the joints. By this method the operator provides himself with a puddling tool and spatula. The puddling tool is usually made from an iron or steel rod, flattened on one end like a flat scraper or screw driver, the edges being ground sharp. The method of procedure consists in agitating the metal while molten, in order to break up the oxide and allow the metal to flow together. This method has the advantage of not making a groove at the break. The puddling tool should be wiped frequently, so that it will not become coated, and the tool must not be allowed to reach a red heat, which would cause oxide of iron to form on it and to dissolve into the aluminum, with consequent weakening effect. The spatula is employed to smooth or level the metal while in a semi-molten condition. Any films or particles of oxide that collect in patches before finishing off the joint should be removed by lightly and quickly drawing the spatula across the surface before it commences to cool. In many cases a weld can be made on castings without the use of a flux in the time taken to prepare the piece so that a flux can be used. For practical purposes the use of a flux in other than special cases is not necessary when the puddling process is methodically performed. Heavy aluminum castings should be bevelled above ¼ in. in thickness. Both edges of the break should be bevelled or grooved to an angle of 45°, so as to form a right angle at the weld. The object of this is to enable the welding to penetrate the entire thickness of the metal. The use of a good flux on prepared aluminum joints is recommended. Better conditions will be obtained both in the structure of the weld and in the external appearance.

Aluminum melts at about 655°C., or 1211°F., and some aluminum alloys have melting points between 1150°F. and 1170°F.; welders should therefore avoid overheating a casting during preheating, otherwise a piece of work which may be quite good, so far as the weld or joint is concerned, may be rendered useless owing to the deformation it has experienced during the preheating process. The temperature should never exceed 700° or 800°F. The proper temperature can be determined by rapping the casting with a stick while being preheated. A cold aluminum casting should give forth a metallic sound when struck, but as it becomes hot the metallic sound becomes less and less, and when the safe preheating temperature has been reached or exceeded it will no longer resound when hit.

Another method is the use of a pine stick, heating the casting no more than required to char or ignite a piece of greasy pine stick brought into contact with it.

Preheating is essential to avoid severe expansion and contraction stresses, and also to conserve gases. The metal conducts heat rapidly, and unless preheated the welder may experience difficulty in maintaining the requisite welding heat although the metal melts at a comparatively low temperature.

Many aluminum castings can be welded without preheating, such as lugs or projecting pieces broken off completely—i.e., where a loose piece is to be welded on one end only.

Aluminum welding fluxes should be purchased from a reliable firm, preferably one making a specialty of this particular line, equipped for accurate work and for properly checking and determining the results. The flux is usually in the form of a very fine powder, which should be kept free from dust and dirt, and in airtight boxes or bottles, because these fluxes are very hygroscopic, and likely to deteriorate by absorption of moisture when exposed to the atmosphere.

A flux consisting of the following ingredients can be recommended:

Potassium chloride	45%
Sodium chloride	30%
Lithium chloride	15%
Potassium fluoride	7%
Potassium bi-sulphate	3%

The most economical method of using the flux, and one which gives very good results, is to apply it to the joint of break in the form of a varnish on the rod. The end of the welding rod is heated and dipped into the flux, which will adhere in the form of a small tuft, to form a thin varnish along the rod for a few inches. It should be unnecessary to supply more flux to the weld than that which varnishes the rod. Too much flux is harmful, and if the rod is varnished with flux, as is here suggested, the gradual melting up of the rod as the weld proceeds will automatically feed flux on to the weld just at the position where it is required.

The welding rod or filling-in material for broken aluminum castings should be an aluminum rod as pure as possible. For aluminum alloy castings the rod should be of the same composition as the parts to be welded. The minimum size of rod used is about 3/32 in. for light castings, and for thick alloy casting 3/16 in. to 5/16 in. diameter rods will be found suitable. The end of the rod should be kept in the molten bath while welding. On no account should globules from the rod be allowed to fall on the surface of the casting. The edges of the break or joint should melt simultaneously with the welding rod. After welding, the weld is thoroughly scrubbed with hot water to remove the excess of flux, which will otherwise corrode the casting. When possible, cold hammering and annealing should be done to improve the welded joint.

Training Foremen

Improving Foremanship and Production by Means Of Conference Courses at Bridgeport Brass Plant

By F. A. WESTBROOK,
Mechanical Engineer

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Just what is meant by "improving foremanship" and just what is its object? Why bring in production?

The answer is easy. Take for instance a situation which occurred in a mill some years ago. The foreman of a gang had been assigned to do some special emergency repair work on a Saturday afternoon in mid-summer when he had planned to go fishing. Being an old timer he regretfully gave up the idea of fishing and set to work in the otherwise deserted building. After the work had progressed to the point of completely dismantling the machine he found that he needed some spare parts from the store room before the machine could be placed in service. Naturally the store keeper was gone and strict orders had been given that nothing should be taken from the store room without the knowledge and consent of the man in charge. In those days and in that plant no provision had been made for such an emergency. The foreman knew that he was not at fault in being caught in this situation because the break-down occurred only a few minutes before closing time and he had just time to catch his own men before they left. He also knew that the production schedule called for the use of this machine on Monday on what he believed to be an important order. Yet he could do nothing without breaking a strict rule of the company by forcibly entering the store room. He realized that he was going to get into trouble whatever he did and the idea of going fishing became more attractive than ever.

To train foremen to meet just such perplexing situations as this, to make the right decision when there is no one to aid them and to create a feeling of sufficient interest in them which will lead to their finding ways around, not necessarily through, their difficulties is the object of the foremanship conferences held by the Bridgeport Brass Company of Bridgeport, Conn. That this is of first importance to the production manager is perfectly obvious to anyone.

Foremanship training courses are nothing new in themselves but until very recently they have been mostly in the nature of formal lectures or classes where information, usually of a more or less technical character, has been passed out by either an outsider or by some person higher up in the company organization. The particular object of the foremanship conferences held by the Bridgeport Brass Company is to draw the foremen into a discussion among themselves about problems which they have to face. For instance, the proper answer to the dilemma of the foreman who had to decide whether to go fishing and fail to do an important job or break a rule to do his assigned work could be much more convincingly decided by discussion within the group than by an officer of the company.

As everybody knows there is nothing harder to do than to draw employees into a free and open discussion where they will say exactly what they think. Nevertheless it has been accomplished and the way in which it was brought about is a most interesting instance of broad minded management. How it was done and the

"CLASS REUNION" OF BRIDGEPORT BRASS COMPANY FOREMEN

circumstances surrounding the initial experiment make a very interesting story.

The management of the Bridgeport Brass Company, widely known for its interest in all new movements which effect their workers, was the first industry in Connecticut to enlist the joint aid of the State Department of Education and the Federal Board for Vocational Education in applying the newly developed conference method of foreman training. Very logically the first step to be taken consisted of a series of conferences of the superintendents at which the conference leader explained the purposes of the foreman training program, asked for suggestions as to what they felt should be covered at the foremen's meetings. An effort was made to assist the superintendents themselves to solve some of their problems by the same conference method to be used later with the foremen.

In all this it must be borne clearly in mind that in following the conference plan, it is no part of the function of the leader to impart any information or to explain any ideas whatever. He simply acts as Chairman of the meeting and exerts all of his energy and ingenuity in calling forth discussion by those present. The exchange of ideas and their classification which is brought about in this way by the men themselves is the object sought and is bound to result in the desired improvement because the individual experiences of the group become organized, and constructive thinking is developed relative to the job of each. This leads to greater ability to deal with such problems as they arise in the course of an ordinary day's work. It causes the foremen to become more proficient in their jobs, which is the best preparation for their future advancement. All this was explained to the superintendents and discussed in their conferences.

Two necessary qualifications for good foremen which the discussion brought out among the superintendents were foresight, and a feeling of responsibility beyond their own departments.

This last item naturally led to a discussion of the very important subject of co-operation which lasted well into the sixth meeting of the superintendents' group. While it is of course impossible to tell of those most interesting conferences in detail, a few of the most important conclusions reached will be given. They are very important from the standpoint of the superintendents in charge of production in the various departments of a good sized plant.

In the first place it was decided by the superintendents that co-operation among themselves and with those above and below them in the organization is an essential part of their work. They also decided that in hiring or promoting a man as foreman, the ability to co-operate is a very important qualification which must be cultivated if necessary, and that in all cases the co-operative state of mind must be stimulated. To create and maintain this mental attitude on the part of foremen it is necessary for the superintendents themselves to set the example, to get the foremen to realize that they are all working together, that this is one of the things they were hired to do; that their own success depends on co-operation, to show the foremen tangible results of lack of co-operation and to show them how the departments are dependent on each other.

The question as to whether a superintendent is ever justified in giving orders directly to the men was thoroughly discussed at one of the superintendents' meetings and it was decided that only in exceptional cases could this be done without damage to the co-operative spirit. On the other hand the foreman should not go over his superior's head without first consulting him, but the "open door" of the president's office inspires confidence and stimulates co-operation.

After discussing the question of co-operation as outlined above, the superintendents made a list of the things the group as a whole had the greatest difficulty in getting the foremen to do. These they rated in the order of difficulty so that they might be covered in the subsequent foremen's conferences. These were: (1) Foresight, or planning ahead; (2) Getting work out on time; (3) Keeping up the quality of the product; (4) Defining responsibilities with regard to co-operation and initiative.

This gives an idea of the most important qualifications which the superintendents think the foremen should have. Now let us see how the conferences are handled to stimulate these attributes in the foremen. In the first place no officers above foremen are present as they would tend to make the men self-conscious and afraid to talk for several obvious reasons. The meetings were between various groups of foremen and were held two hours daily on Company time. Furthermore it should be borne in mind that these are general discussions among the foremen, so directed that they will educate themselves. If, for instance, one of them has gone fishing on a Saturday afternoon because he could not carry out his instructions without breaking Company rules and his own crowd shows him where he might have done better, he is easily convinced; whereas if his superior does it, in nine cases out of ten it leaves bad feeling and lack of conviction. There is no set program and the discussions develop as they go along.

The discussions were started somewhat as follows: The conference leader stated that he did not know enough about the foreman's job to try to teach them anything, but that they had devised ways of doing their work in a satisfactory manner and that it was a well known fact that if such a group pooled their experiences they would all be able to do still better work. The leader then listed the responsibilities of each foreman as they saw them and the ten responsibilities most difficult to discharge in the opinion of the group were then set forth on the blackboard for discussion in the order of their difficulty. It was agreed that the worst of these was keeping down waste. The causes of this were analyzed into seventeen items and the responsibility for these was indicated by each foreman. These proceedings were spread over some six meetings and of course a great deal of discussion and argument and the citing of specific cases took place. It is a most interesting fact that, whereas at the beginning there was a marked tendency for the foremen to blame others for the causes leading to waste, at the end of the discussion the group came to the conclusion that the foreman is entirely to blame for some of the causes and is partly responsible for all of them.

Thus we see an example of the value of free discussion ably led, for such conclusions as were reached here, with the resulting mental attitude, could never have been brought about by superiors. It certainly has been an effective way of developing men who think for themselves and act accordingly, which is the great need of those responsible for production.

As the discussions went on new subjects continually came to the fore. For instance, during the exchange of opinion regarding the reduction of waste the matter of instructing workmen was frequently mentioned so that this was next taken up in detail. This brought out the fact that there is a vast difference between letting a workman learn by making mistakes, watching others, showing or telling him, and instructing him; all but the last being unintelligent, wasteful, discouraging and slow, even if along the lines of least resistance at the moment. This led to various members attempting to teach actual shop operations to another member or to the whole group.

These included such things as how to inspect flashlight tubes; how to inspect, assemble and wrap bends and sink plugs; marking socket shells; testing nickel plating solutions for acidity, and many others. In each case these demonstrations of teaching were discussed and ways in which they might be improved were suggested by members of the conference. It was finally pointed out that in the Bridgeport Brass Company, a conservative estimate shows that it cost $10.00 to place a new man at work, $30.00 to $40.00 to break him in, $5.00 to transfer a man to another department and $2.50 to discharge him. Consequently improvements in instruction which result in reducing waste of time and material and in decreased labor turn-over will pay the most handsome returns.

Lack of supervision of the right kind was also agreed upon as a cause of waste and in discussing the best ways of giving adequate supervision it was decided that the only rule which could be followed was that of analyzing each job and basing the amount of supervision on the weak and difficult points thus discovered. Horse-play also came in for universal condemnation.

A part of the conferences was given over to self-analysis. The foremen were asked to consider the characteristics which they considered a good foreman should have and to list them. The number of qualifications thus stated was so large that it was boiled down to seventeen which are so interesting and important (especially when it is remembered they were formulated by the foremen themselves) that they are here given:

Thoroughness	Fairness
Resourcefulness	Concentration
Co-operation	Personal Habits
Judgment	Character
Loyalty	Personality
Memory	Physical Condition
Observation	Initiative
Adaptability	Foresight
Decisiveness	

To stimulate self-analysis each foreman was then asked to ask five questions regarding each of these qualifications. For instance, some of the questions asked regarding thoroughness were, "Do I make clear explanations? Do I consider details carefully?" "Do I carefully supervise the work in my department from the time it comes in until it is finished?" Much time was spent in discussing all of these things and naturally it set the foremen thinking about their jobs as they had never thought before.

Sixteen of these conferences were held with each group of foremen and as can be seen much ground was covered. That the discussions, leading from one thing to another and always of value, could be carried on almost indefinitely, is equally evident. Actually, the specific matters discussed are of less importance than the fact that the discussions took place, because of the mental attitude which they created and the thinking which was set in motion. Periodic meetings of this kind will keep these processes active and it is planned to have them with sufficient frequency to keep the foremen stimulated and interested.

Perhaps the most convincing proof that tangible results have been attained by the Bridgeport Brass Company is a certain occurence to which one of the superintendents never before had a parallel in his department and which took place not long after the conclusion of the conferences. It was a case of overtime work on an important rush job over a week-end in summer. As luck would have it a machine broke down after the plant had closed and there was no one around to repair it. The foreman in charge felt his responsibility but was at his wits' end. He tried telephoning to the superintendent but he, knowing that he had left a good man in charge of the work, had gone down to the shore for a swim and could not be reached. The foreman looked over the machinery carefully and being a resourceful man he decided that he could fix it himself if only he could get a certain part. The store-room of course was closed so he tried telephoning the store-keeper but he also was enjoying the summer afternoon away from home. However by this time the foreman had made up his mind that he was not going to be outdone so he telephoned to several places outside the plant where he thought he might be able to get the essential part. After several calls he located what he needed, gave one of his men the money to pay for it out of his own pocket and sent him out to get it. That evening the superintendent had a telephone call from a much concerned foreman who wondered whether he had done right and whether he would get his money back from the Company. "If that is not real co-operation," said the superintendent, "I would like to know what is, and I am sure that the conferences were responsible for it. They brought out the good qualities of a good man."

After the first set of classes had completed its course there was a "class reunion" with an afternoon of outdoor sports and an evening of good fellowship, where the interest which the foremen had taken was shown in unmistakable terms.

Grinding in Brass Stops or Faucets

Q.—Please tell us of a compound for grinding in brass stop cocks. The abrasives used for automobile valves are unsatisfactory for our work.

A.—Take an old crucible and fill with Albany moulding sand. Place it in the brass furnace that you use for melting metal and let it remain all night with some coke around the crucible. Remove in the morning and empty the crucible of burnt sand. Procure a flour bag that the moulder uses for dusting his moulds. Sift the burnt sand through this bag. This makes it very fine. See that no grit enters the sifted material. Mix it in a half-pint cup with water and soft soap; stir thoroughly. If you are large manufacturers of brass stop cocks, you can procure a grinding sand from a commercial producer of this material. Specify 5/0 grade or 7/0 grade. See that bodies are reamed smooth, plugs fitted to a perfect taper and that very little grinding required. Wash the plugs and bodies in hot water.—P. W. Blair.

Treating Old Babbitt Metal

Old babbitt metal can be reclaimed and made over, practically, by a simple and inexpensive method, as follows:

Into 100 lbs. of melted old babbitt metal, dip 1 oz. of copperas wrapped in screen wire. This fluxes the babbitt, which should be stirred until all bubbling ceases.

The treatment should cost about 2 cents for each 100 lb. lot and should result in a surprising improvement in practically any old babbitt metal. It should become harder, finer grained, easier to pour and equal to high grade babbitt.—W. L. Blanchard.

Brazing Compound

Q.—Can you tell us how to make a compound for brazing with hard solder which will not leave a very hard scale?

A.—Mix a pint of boiling water with one pint of borax, then add two pints of boric acid. This will make a thick, smooth paste which can be readily applied to the work and which will not leave any scale.—P. W. Blair.

Electrochemical Society Meeting

A Report of the Papers Presented at the General Meeting of the American Electrochemical Society at Bridgeport, Conn., April 26, 27 and 28, 1928

The Technical Session on Electrodeposition which was the final feature of the program for the three-day meeting of the American Electrochemical Society, held at the Hotel Stratford, Bridgeport, Conn., April 26, 27 and 28, was well attended by chemists and electroplaters. The attentive audience and the discussion of some of the papers, more than half of which dealt with chromium plating, indicated that the results of research in electrodeposition are being treated with great consideration by both technicians and men practically engaged in electroplating.

The session was presided over by Professor E. M. Baker of the University of Michigan; Dr. Colin G. Fink, of Columbia University, who is secretary of the Society, assisted.

The committees on the election of officers returned the following results: Electrothermic Division, chairman, Charles E. Styer; vice-chairman, T. F. Bailey; secretary-treasurer, H. M. St. John. Electrodeposition Division: chairman, D. MacRae; vice-chairman, C. L. Mantell; secretary-treasurer, A. K. Graham; members-at-large, Stewart Colvin, H. E. Haring; foreign representatives, A. H. W. Aten; A. P. Newall; D. J. MacNaughtan, R. B. Wood.

The following are summaries of papers pertaining to non-ferrous metals and electroplating which were read at the meeting:

Annealing of Non-Ferrous Metals in the Electric Furnace. By Robert M. Keeney.

Selection of the source of heat for the annealing of non-ferous metals and alloys is an economic problem, and the decision made should be based on the over-all cost of the finished product with the different forms of heat. At the present time 27 electric furnaces and annealing machines of a total capacity of almost 6,000 kilowatts, are in operation in 15 Connecticut plants, for annealing in the finishing stages of manufacture of non-ferous metal products. For this class of work the electric furnace has proven more economical than oil or gas, in many cases resulting in an annual return of 50 per cent on the investment. In the rolling mill, however, little progress has been made, although the cost of electric annealing on a heat basis only compares favorably with the cost of oil annealing. This situation is due to failure to consider economies in over-all cost which electric annealing may produce, the basis on which electric heating has made such great progress for tonnage production in the motor industry.

The Properties of Graphite Used in Electrotyping. By J. H. Winkler and W. Blum.

The properties and behavior of graphite films on wax were studied both in the laboratory and in commercial electrotyping plants. On the basis of the results, tentative specifications for graphite for use in electrotyping are suggested.

Nickel Electrotyping Solutions. By W. Blum and J. H. Winkler.

Experiments were made upon the rate of covering of nickel on graphite, and the properties of the nickel deposited from solutions of different composition and under different conditions. A simple solution for commercial electrotyping was developed, and has been used successfully in a number of plants.

Influence of the Cathode on the Electrodeposition of Chromium. By Hiram S. Lukens.

The production of passive nickel by electrodeposition is reported. The influence of passive nickel, of active nickel, copper and lead on the composition of solutions for the electrodeposition of chromium is studied and the results discussed. Means for correcting the chromic salt and sulfuric acid content of solutions for the deposition of chromium are indicated.

Behavior of Plating Baths and Anodes During Electrodeposition of Chromium. By Richard Schneidewind and Stephen F. Urban.

In this study of the behavior of chromic acid plating baths during electrolysis, special emphasis has been placed upon the relationship between anodes and the solution composition. If all plating conditions are kept constant, trivalent chromium in the bath approaches an equilibrium concentration, a condition of steady state. The magnitude of this concentration is a function of the following conditions; Anode current density, the nature of the anode material, the temperature of the bath, and the sulfate concentration of the bath. Where iron anodes were used they dissolved at a constant rate during electrolysis. The solubility is also affected by the above mentioned conditions. Lead is less soluble at low temperatures, but proved even more soluble at high temperatures than iron. Dissolved iron and trivalent chromium greatly contract the range of current densities at which good plate is produced.

A Thermodynamic Study of Fundamental Corrosion Reactions. By W. J. Sweeney.

The fundamental corrosion reactions of iron in the absence of oxygen and the iron-ferrous ion-hydrogen equilibrium are discussed from an electro-motive and also from the free energy standpoint. From a critical survey of the literature on the solubility of iron and of ferrous hydroxide, a solubility product of $10^{-18.8}$ and a provisional value of —120,920 calories for the free energy of formation from the elements of ferrous hydroxide are obtained. With this value at hand the conclusion is drawn that there is a small free energy decrease for the attack of iron by water to form ferrous hydroxide and hydrogen even in the absence of oxygen. The interdependence of the iron, ferrous ion, hydrogen ion, hydrogen equilibrium and the ferrous hydroxide equilibrium is also pointed out.

The Effect of Trivalent Chromium and Iron on Chromic-Acid Chromium Plating Baths. By R. Schneidewind, S. F. Urban and R. C. Adams, Jr.

It has been found that the current efficiency of chromium deposition from chromic acid baths is a straight line function of the logarithm of the current density. The slope and position of this line are affected by the temperature and composition of the bath. In baths containing chromic acid and sulfate ion, bright deposits having a thickness of 0.0007 mm. (0.00003 in.) or less are obtained on copper between limits corresponding roughly to 5 per cent and 20 per cent current efficiencies.

In cases of other metals the range of current efficiencies yielding bright plate may be narrower. Heavy deposits on all metals are best obtained at 12 to 14 per cent current efficiency. Other things equal, increasing the concentration of trivalent chromium and iron does not appreciably change the relationship of current density to current efficiency. However, the range of current densities producing bright plate is markedly contracted.

Melting Sterling Silver in High-Frequency Induction Furnaces. By Robert H. Leach.

This paper gives the operating data obtained from melting sterling silver in Ajax-Northrup high frequency furnaces at the plant of Handy & Harman, Bridgeport, Conn. The performance of both the oscillator and motor generator types is given, as well as the relative efficiency of the air-cooled and water-cooled coil when used with the generator type. A brief summary of costs as compared with the operation of oil-fired furnaces is also given.

On the Electrodeposition of Thallium. By O. W. Brown and Sister Amata McGlynn.

Upon making a thorough review of the work on this subject, it was found that no encouraging results had been previously obtained. The purpose of the present investigation was to prepare a solution of thallium salt, which, upon electrolysis, would give a smooth, coherent deposit of thallium on the cathode. An effort was also made to study the effect upon the deposits of variations of strength and acidity of the solutions, the current density, the temperature, the time, the electrodes, and addition agents. We found that smooth, coherent, satisfactory deposits were obtained with a perchlorate bath, using peptone as an anodic depolarizer, cresylic acid as an addition agent and current densities of 0.5 to 1.8 amp. per sq. dm.

Photomicrographic Study of Rough or Nodulized Electrodeposited Nickel. By C. Upthegrove and Edwin M. Baker.

Nodulized or rough nickel deposits are undesirable in that they cause rejections of plated work, increase the difficulty of buffing, and lower the protective value of the plate. A photomicrographic study was made of some excessively nodulized deposits. This study showed that the nodules are apparently not related to imperfections in the base upon which the plating is done nor to the method of cleaning, as the nodulized growth may start after metal has been deposited to some thickness. In general, it is believed that the nodules are a result of suspended particles in the bath which may come in contact with the surface of the metal after deposition has started. The indicated remedy, therefore, is the maintenance of more nearly clear solutions.

Electroplating on Aluminum and Its Alloys. By Harold K. Work.

Electroplates of most metals on smooth aluminum surfaces are of doubtful value unless heat treated. Plating on a roughened surface is recommended as being a practicable procedure. Methods of plating the common alloys are given. A dip is described for commercially pure aluminum, which roughens the aluminum and simultaneously forms an immersion layer on the surface. For alloys containing a eutectic network, a dip which attacks one constituent of the network is advised. Where the strong alloys are plated an excellent product is easily obtained, providing the alloy has been subjected to the usual heat treatment, as is customary for these alloys, to develop their strength.

Notes on the Hardness and Structure of Deposited Chromium. By Leland E. Grant and Leroy F. Grant.

The effect of current density and temperature on the hardness of chromium deposits was investigated. The hardest deposits were obtained at relatively high current densities. The occurrence of a network of cracks was observed in some deposits. The significance of this condition in relation to corrosion resistance is discussed.

Babbitting Brass Castings

Q. We would appreciate it very much if you would give us some information relative to the following:

We have a number of brass castings 8″ long by 4″ wide which are babbitted and used for bearings on heavy machinery. Our problem is that we cannot get the babbitt metal to amalgamate with the brass castings, causing the whole babbitt to let loose and spread around.

Any suggestion you may offer that will enable us to close the bond between the babbitt metal and the brass castings will indeed be appreciated.

A. Evidently your castings are very smooth on the inside and therefore the babbitt metal has no chance to get a grip that will hold. Tinning the casting before pouring the babbitt will sometimes do the trick satisfactorily but there is always a doubt as to the permanency of the job.

One way is to cast into the bearing some irregular shapes, such as slots running at right angles to each other. This method will prevent the babbitt from turning but it will not prevent it from lifting out. A better way is to drill a series of holes, about 5/16″ to ½″ diameter, size to suit your convenience, around the casting. This method will form a number of fastening keys made of babbitt, when pouring the molten metal. Since they will all look in different directions it will be impossible to loosen the babbitt from the casting unless these keys be broken off. To cover the holes on the exterior part of the casting while pouring, use a woolen cloth fastened on with wire. Sometimes, if the brass is round and not split at the center, it may be tapped at each end with a coarse threaded tap, leaving a blank space in the center to form an end key.

Pour the babbitt at as low a temperature as possible and have it run sharp. A dry pine stick should be used to stir the melted metal and the metal should never be hot enough to set the stick on fire. Heat the brass part before pouring.—W. L. Abate.*

Separating Gold and Silver

Q.—Will you kindly favor a subscriber with information regards to recovering gold and silver from old findings. I have 100 lbs. of gold and 250 lbs. silver plated findings. I would like to cut down with acid and reclaim the gold and silver as pure metal.

A.—It would pay you to melt this metal into bars or bricks and sell it to the U. S. Assay Office, or to one of the well-established refiners. For you to refine it with acid would take large amounts of acid. It should be refined by electrolytic methods, the equipment for which is very expensive, but which the larger refiners have. That is why they can refine this kind of material more cheaply than you can.—Jewelry Metallurgist.

* Posthumous publication of an article written by Mr. Abate before his death, which occurred on February 20, 1928.

Crystal Spotting of Sulfide Finishes

A Summary of the Completed Research Work on Crystal Spotting Carried on From January, 1927, to March, 1928, Under Platers' Research Fund*

By W. P. BARROWS

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I.—INTRODUCTION

In order to determine the nature and scope of the "spotting out" problem visits were first made to a number of plants, especially those engaged in the manufacture of builders' hardware. Examination of the samples obtained from these and other sources, showed that there are at least two types of spotting out. The first, observed only on lacquered sulfide or "oxidized" finishes, occurs in the form of "dendritic" (tree-like) crystals, usually with a black or nearly black color. These have been designated as "crystal spots," and have formed the principal subject of the investigation up to this time. The second type observed most frequently on cast metals, consists of irregular areas of various colors, to which the term "stain spots" has been applied. This subject is now being studied.

In the experiments upon crystal spots, information was obtained not only from numerous platers and chemists connected with plating; but also from persons engaged in the study of lacquers, varnishes and paper, both at the Bureau and in commercial plants; and from metallographists, mineralogists, petrographers and X-ray investigators at the Bureau of Standards, Bureau of Chemistry and Geophysical Laboratory. The large amount of time consumed in such visits, conferences and correspondence was fully justified by the helpful suggestions received.

The principal experiments conducted and conclusions reached, will be summarized in what now appears to be their logical order, instead of in the chronological order in which they were conducted. Because of the many factors which might have a bearing upon the problem, and the impossibility of anticipating them, it was frequently necessary to repeat certain experiments after the effects of other variables were subsequently detected. Owing to the fact that the occurance of these spots is not uniform or quantitative, it was necessary to subject at least ten or twenty specimens to each set of conditions in order to obtain reliable "average" performances. Most of the specimens were prepared in the laboratory, but wherever feasible, corresponding plant samples were included in the tests.

In order to obtain at least comparative results in a short time, an accelerated test was developed after certain preliminary experiments had been made. Unless otherwise stated, the tests were made by storing the specimens in contact with ordinary rubber bands, in a closed desiccator at ordinary temperature and 90 per cent humidity. Under these conditions spots usually appeared in from one to three days; while in the absence of sulfur or rubber it often required from one to three months for the appearance of the spots.

II.—THE METAL

In order to determine whether the metal on which the sulfide finish is applied, affects the tendency for crystal spots to form, tests were made with sulfide finishes on sheet copper and brass, and on sheet steel plated with copper or brass. The results showed that there is no difference in the behavior of these metals. It is evident therefore that the crystal spots are connected with the copper sulfide itself, and not with the underlying metal.

III.—THE COLORING

1. Composition of Films:

Experiments were made with black films produced on copper or brass by (1) the action of potassium or sodium polysulfide, (2) black nickel plating from sulfocyanate solutions, (3) black nickel plating from nickel chloride solutions containing no sulfur, and (4) copper carbonate black. The results showed that spots appeared only upon (1) and (2), i.e. those in which sulfur was present in the films.

2. Preparation of Films:

In order to determine whether any of the materials other than the sulfide used in the preparation of the sulfide films were responsible for the spots, films were produced by exposing to hydrogen sulfide, copper that had not been subjected to any acids or alkalies. The black film so produced resembled that made with sodium or potassium polysulfide, and showed the same tendency for crystal spots. As in this reaction nothing but copper sulfide can be formed, it is evident that neither acids nor alkalies are necessary for the formation of these spots.

IV.—THE COATING

1. Relation of Lacquer to Spots:

Experiments with lacquered and unlacquered specimens showed that although certain conditions such as exposure to sulfur would cause discoloration of the unlacquered speciments, no crystal spots appeared except on the lacquered specimens. Evidently the presence of a film of lacquer or similar material is necessary for the formation of such crystals.

2. Thickness of the Lacquer:

Experiments with thick lacquer films, produced by applying three coats of lacquer, showed that while the formation of crystal spots was somewhat retarded, the improvement was not sufficient to warrant the extra trouble and expense.

3. Composition of the Lacquer:

As the crystals apparently grow between the surface of the sulfide film and the lacquer film, it appeared possible that by increasing the adherence of the lacquer the formation of the spots might be retarded or prevented. Over twenty experimental nitro-cellulose lacquers were prepared and tried out for this purpose. These contained variable proportions of linseed oil, varnish, castor oil, fish oil, and other additions. Although none of these lacquers entirely prevented spotting out, those containing linseed oil showed a marked improvement in this respect. Unfortunately, however, lacquers containing linseed oil show a tendency to discolor the finish, both on the dark and the relieved portions, and hence their use is impracticable.

* An introduction to this report stresses the fact that there are two entirely distinct types of spotting out which have no relation to each other, viz.: crystal spotting and stain spotting. The work on crystal spotting has been practically finished; the laboratory study of stain spotting will now be undertaken. The Research Committee invites criticism of the results as reported here and also suggestions regarding other possible remedies for crystal spotting.

4. **Acidity of the Lacquer:**

As it was suggested that free acid in the lacquer might cause or accelerate the spotting, experiments were made with carefully neutralized lacquers, and with lacquers containing appreciable free acid. The spotting occurred equally with all these lacquers. The lacquers with free acid tarnish the surface, but do not affect the crystal spotting.

5. **Sulfide Particles in the Lacquer:**

It was also suggested that the presence of suspended particles of copper sulfide in the lacquer, such as might be scraped or washed off of the "oxidized" surfaces during the lacquering might accelerate the spotting. Some of the sulfide was therefore scraped off and mixed with lacquer which was then applied. No evidence was found that the presence of such particles affected the formation of crystals.

6. **Substitutes for Lacquer:**

In order to determine whether transparent coatings other than nitro-cellulose lacquers might be beneficial, experiements were made under accelerated conditions with shellac, varnish, and bakelite. With shellac and bakelite coatings, crystal spots were produced as readily as with lacquer. With spar varnish there was little or no formation of crystal spots, but the varnish reacted with the copper sulfide to form a green color, and was therefore unsatisfactory.

V.—THE SURROUNDINGS

1. **Sulfur:**

Contact with sulfur is the most rapid means of accelerating the formation of crystal spots. If the surfaces are sprinkled with powdered sulfur, spotting usually occurs in a few days. Even in this case, however, it is propably the sulfur vapor, produced by the very slow evaporation of the sulfur, that causes the spots. Experiments with lump sulfur, contained in the same vessel with the specimens, but not in contact with them, showed that it also accelerates spotting, but not so rapidly as does the powdered sulfur.

2. **Rubber:**

Rubber usually contains free sulfur, and in these tests it was found to produce the spots as readily as does powdered sulfur. That the effect of ordinary rubber is due principally to the presence of free sulfur on the surface, and its evaporation, is evident from some experiments with a special "non-blooming" rubber that contains little or no free sulfur. It was found that with the non-blooming rubber only about one-third as much spotting is produced as with ordinary rubber.

3. **Sulfur Compounds:**

Experiments with air containing from 0.1 to 1.0 per cent by volume of hydrogen sulfide, showed that with even the lowest concentration, crystal spots occur, but not so rapidly as with free sulfur. The hydrogen sulfide also causes tarnish. Air contaning 1 per cent of sulfur dioxide causes rapid tarnish of the specimens, but no formation of spots.

4. **Paper:**

Extensive experiments have shown that the spotting is accelerated by contact with certain papers, especially kraft paper such as is often used for wrapping. Actual contact with the paper appears necessary to produce the spotting. Thus when two or more specimens were so wrapped that the paper came in contact with only one side of each plate, crystal spots appeared only on that side. It is difficult, however, to show a direct relation between the sulfur content of the paper and the effect on spotting. Filter paper with only 0.0007 per cent sulfur caused about as much spotting as kraft paper with 0.002 to 0.003 per cent of sulfur, or cellophane with 0.005 per cent of sulfur. It is equally difficult to attribute the spotting to any constituents of the paper other than the sulfur.

5. **Determination of Sulfur in Paper:**

The various methods that have been used or suggested for detecting or determining sulfur in paper all relate to the sulfur which is present as sulfide or in some form that sulfide may evolve hydrogen under certain conditions. Inert substances such as calcium sulfate that may be used as fillers, are not included in the determination of sulfur as conducted for this purpose. Among the methods suggested are (a) wrapping polished silver in the moistened paper and determining the extent of the tarnish; (b) heating the paper with zinc and hydrochloric acid, bringing the evolved hydrogen sulfide in contact with moist lead acetate paper and noting the color produced; and (c) treating the paper with zinc and hydrochloric acid, passing the gasses into an alkaline cadmium solution, and titrating the hydrogen sulfide by the method used in determining evolution sulfur in steel. Of these (b) was found most promising, as (a) is not suited for quantitative work (except perhaps to detect some minimum content of sulfur); (c) is difficult to apply with small samples of the paper and with larger samples it is difficult to expel all the sulfur.

A large amount of work was required to so define the conditions in method (b) as to yield concordant and reliable results. It was found that the paper must be finely macerated, and that at least two grams of zinc, and 20 cc. of concentrated hydrochloric acid (diluted to about 100 cc.) must be used for each gram of paper; and the heating, with occasional boiling, should be continued for at least one hour to expel all the hydrogen sulfide. Color standards are prepared by introducing in blank experiments known small amounts of sodium thiosulfate. The standard lead sulfide papers thus produced vary in color with the amount of sulfur present, and can be kept in a closed dry vessel for long periods without changing color. It was found that with the conditions selected reliable results can be obtained not only for ordinary wrapping paper and card board, but also for wax paper or oiled paper; which give misleading results under other conditions.

6. **Effect of Humidity:**

As it is commonly believed that high humidity is partly responsible for the formation of these crystal spots, an extended study of this subject was made. The specimens were kept in desiccators with a definite moisture content, controlled by the concentration of the sulfuric acid in the desiccator.

Experiments in which the samples were kept in 90 per cent humidity without any rubber, sulfur, paper or other accelerating agent present, showed at the end of eight months very few spots. It is evident, therefore, that moisture alone does not cause or accelerate this type of spotting.

When the specimens together with rubber or sulfur were kept in vessels with respectiviely zero, 20 per cent, 55 per cent, and 90 per cent humidity, the spotting occurred to an equal extent. It is evident therefore that the acčelerating action of sulfur is not appreciably influenced by the humidity.

Specimens wrapped in various kinds of paper were subjected to similar variations in humidity. No differences in the spotting were observed except with "cellophane" paper, which contains more sulfur (0.005 per cent) than any of the other papers used. With this paper

a high humidity appeared to increase the tendency toward spotting and also caused tarnishing.

7. **Effect of Oxygen:**

As spots formed occasionally, though slowly, when no sulfur, rubber or paper was present, it was thought that the oxygen of the air might contribute to their formation. The fact that when specimens in contact with sulfur were kept in a vacuum for 75 days, no spots appeared although tarnishing occurred, seemed to confirm the view that oxygen is necessary. When, however, other specimens and sulfur were kept in pure oxygen and pure nitrogen respectively, spotting occurred to an equal extent in each. This shows that oxygen is not necessary; and leaves unexplained the results obtained in a vacuum.

VI—THE COMPOSITION OF THE CRYSTALS

The fact that these crystals form only when copper and sulfur are present, at least indicates that they consist of copper sulfide. Two forms of copper sulfide occur naturally, cupric sulfide CuS, as the mineral covellite, and cuprous sulfide, Cu_2S, as the mineral chalcocite. The crystals present in the spots are exceedingly thin and so light that it was impracticable to collect enough for a chemical analysis. Mineralogic and petrographic examination also failed to determine the identity of the crystals.

It was therefore decided to make an X-ray examination. A small amount (about 1 mg.) of the crystals was obtained by removing the lacquer with butyl acetate, after which the crystals could be brushed or floated off without disturbing the under layer of black copper sulfide. Some of the latter was also scraped off for purposes of comparison. X-ray patterns were then made of (a) the crystal spots, (b) the black coating, (c) covellite and (d) chalcocite. The pictures showed very conclusively that both the crystals and the black coating have a pattern identical with chalcocite, and different from covellite. They are, therefore, both cuprous sulfide, Cu_2S.

The crystals of cuprous sulfide may conceivably be formed in either of two ways, (a) by a recrystallization of the much finer (but also crystalline) coating produced by the action of the sodium polysulphide on the copper, or (b) by the formation of new cuprous sulfide by the slow action of sulfur upon minute areas of copper that may be exposed through the original sulfide film. The latter view is rendered more plausible by the fact that (1) the crystal formation is accelerated by the presence of sulfur vapor and (2) the crystals are most likely to form where there is a slight scratch, which may penetrate not only the lacquer but also the sulfide film. At best it is still difficult to fully explain the formation of these crystals. It is possible that the presence of the small amounts of sulfur simply "catalyzes" the formation of the crystals by a process of recrystallization.

VII—POSSIBLE REMEDIES

The only promising methods of preventing the crystal spots would be (1) to employ finishes containing no sulfur, or (2) to prevent sulfur or sulfur compounds from coming in contact with the finishes. As (1) would involve a complete change in the methods of manufacture it could be considered only if conditions were far more serious than at present. The second remedy can be accomplished by (a) keeping the articles away from sulfur, rubber, or paper with a high sulfur content; or (b) applying some lacquer or similar coating which is practically impervious to sulfur. (a) is largely a matter of conditions in the manufacture, storage, transportation and display, which can be controlled at least enough to avoid flagrant access of sulfur. In addition it is possible to exclude sulfur and prevent the spotting (unless large amounts of sulfur are present), by the use of impervious wrappings such as tin foil and wax paper. The former is quite expensive, but the latter might be warranted if extreme conditions of spotting are encountered. Tests were also made with "anti-tarnish" paper, which consists of paper impregnated with lead acetate or zinc acetate. These tests indicated that when such papers are dry (i. e. at ordinary humidity) they show very little tendency to absorb sulfur or hydrogen sulfide. It is doubtful, therefore, whether they would effectively exclude sulfur except possibly in a very high humidity.

Under (b) it is still possible that some lacquer or other coating may be discovered or developed that will be superior to the ordinary nitro-cellulose lacquers. We are now investigating several such coatings.

The only film that has thus far been found to prevent crystal spotting under most conditions is a grease film, such as may be applied to the lacquered surface by dipping the articles in a dilute solution (4 per cent or less) of petrolatum in carbon tetrachloride. When the solvent evaporates, the remaining film may be wiped to remove most of the grease. This method is relatively inexpensive, but produces a finish that is somewhat objectionable. Here again such a remedy is only warranted if for any reason the spotting is so serious that extreme measures must be used, at leat temporarily. Even this method, however, will not prevent some spotting if large amounts of sulfur are present in the surroundings.

VIII—PLANT TESTS

In order to determine whether the laboratory experiments with grease films and wax paper are confirmed in practice, a large number of samples have been so treated in several plants. These, together with control samples will be subjected to marine and railway transportation and to storage under different conditions. Several months will be required before definite conclusions can be drawn from these plant tests.

In the meantime the study of stain spots will be undertaken. Considerable information and numerous samples have been obtained and exploratory tests are now under way to determine the principal factors involved.

Reclaiming Brass Castings

Q.—We have become greatly interested in the article "The Reclamation of Defective Brass Castings" in the January, 1928, issue of THE METAL INDUSTRY. Can you furnish us with the full particulars and a method to pursue? We have tried it ourselves but have not been very successful.

A.—Adjust the flame until there is a single cone such as is used in steel welding. Use a tip about one size larger than is used on steel. Keep the point of the white flame slightly separated from the weld according to the thickness of the piece so that the heat will not be sufficient to burn the copper in the brass or to volatilize the zinc. If a white smoke appears, remove the flame, as this indicates excessive heat. Use a little borax as a flux.

There is also the electric spot welding method, which does not discolor the surface and is rapid.—P. W. BLAIR.

Bridgeport Branch Holds Banquet and Session

Nearly 200 Attend Annual Affair at Stratfield Hotel on Saturday, April 28—Good Technical Papers Read

The Bridgeport Branch of the American Electroplaters' Society held its annual educational session and tenth annual banquet on Saturday, April 28, at the Hotel Stratfield, Bridgeport, Conn. There were about 75 in attendance at the session in the afternoon and close to 200 at the banquet and dance in the evening. The affair was highly successful and a number of people who had attended the meeting of the Electrochemical Society, which was held at the same hotel, were present at the Bridgeport Branch session and banquet.

R. J. O'Connor, president of the Bridgeport Branch, opened the session with a brief address of welcome to the members and guests, after which he turned over the meeting to Charles H. Proctor, founder of the American Electroplaters' Society, Research Engineer for the Roessler and Hasslacher Chemical Company, and Plating-Chemical Editor of THE METAL INDUSTRY, who presided for the remainder of the session. Mr. Proctor introduced the speakers and made a number of valuable comments on the subjects discussed.

Karl Pitschner, electrochemist, delivered the first paper, entitled pH Determination, which gave the results of a number of experiments that were performed in an effort to arrive at an efficient and accurate means of determining the hydrogen ion concentration or acidity of electroplating solutions. Mr. Pitschner briefly explained the meaning of "pH," the symbol for hydrogen ion concentration, and the importance of accurate methods of determining this in order to keep plating solutions uniform as to acidity. He then described the three common methods of determining pH values, namely, colorimetric measurement by comparison of tinted solution and a tinted standard; observations of the color of solutions through a series of colored glass discs held in a clip designed for the purpose; and, third, by the electrometric method, involving the use of a device containing a millivoltmeter and a potentiometer.

The colorimetric method is most commonly used by the electroplating industry, according to Mr. Pitschner's paper. A color standard is prepared and used in several ways, chiefly with the wedge type comparator having a graduated scale. The helical clip method is similar to this. Here the solution is taken in a test tube and matched to the colors in the clip discs, the disc which the solution tested matches showing the pH value. Both of these methods are reliable for a period of perhaps a year, after which the standard colored solutions must be checked if accurate results are to be obtained. The difficulty with using colored glass as the standard is that it is extremely difficult to tint the glass the exact shade needed. Both methods have certain other disadvantages. The range where color changes are useful is very narrow; it is difficult to read the results; coloring the solutions is difficult. Changes indicated by the color method are most noticeable at the acid end of the scale, growing less distinct toward the alkaline end. Thus, solutions which are acid in nature are more easily tested by the color system than solutions which are alkaline.

The electrometric method gives results in millivolts which can be translated into pH values by simple calculation. In experiments it was found that results obtained by this system did not tally exactly with those obtained by the colorimetric method, the same solutions being tested. The results, however, never showed differences greater than .05 for any given solution. The paper suggests that this discrepancy points to the need of further research in the determination of pH values.

In discussion, Dr. William Blum suggested that the differences shown between results obtained by various methods of measuring the pH value of any given solution did not mean that the pH value could not be kept uniform if any one method were used. He stated that if one method were found to be consistent, then the pH value of a solution could be determined and kept uniform as long as no other method of measuring was introduced. He said that the color method was the simplest and easiest for the electroplater and that disregarding its defects as shown by Mr. Pitschner's experiments, it was considerably more accurate than the old litmus paper test.

George B. Hogaboom, of the Hanson-Van Winkle-Munning Company, Matawan, N. J., presented a paper on The Crystal Structure of Metals, the result of a long period of research work. Mr. Hogaboom illustrated his talk with a remarkably fine collection of metallographic slides which A. K. Graham projected on the screen. He gave a clear and lucid explanation of the manner in which crystals distribute themselves in metals, both ferrous and non-ferrous, their shapes under different conditions and after varying treatments of the metals, and the effect of their shapes and distribution on any working of the metals. He demonstrated the effect of crystal structure of anodes on corrosion in electroplating baths. He suggested that heretofore electroplaters have contented themselves with attempting to coat metals with other metals with no precise knowledge of the structure of either the basic material or the metal used for coating, but that if the finest results are to be obtained, the electroplater must know the properties of the substances he works with and guide himself accordingly. He then projected the illustrations, giving the audience what might be termed an elementary course in metallography, with the intention of showing the relation of the crystal structure of metals to electroplating. He showed how anodes having very large crystals have intercrystalline impurities which tend to sluff off metallics in the plating bath and coat the anodes, preventing proper corrosion.

Mr. Louvain inquired whether there was any positive means of keeping brass anodes clean, and Mr. Hogaboom replied that this involves several factors, mainly keeping the metallic content of the solution at a definite ratio as to copper, zinc and lead. This can be done, he said, by analytic control of solutions. Polarization is also a cause of unclean anodes, according to Mr. Hogaboom, and this, too, can be prevented by careful practice. Mr. Proctor suggested that it might be better to let metallurgists do electroplating; however, he indicated that their lack of practical plating experience might hamper them somewhat. He said that if pure copper and the best grade of zinc were used in the anodes there might be less difficulty with accumulations of impurities. Mr. Proctor then inquired as to the nature of the anodes used by Mr. Louvain, who replied that they were cast brass, 80 copper, 20 zinc, with a surface of 16 sq. ft. on each of four rods in a barrel plating apparatus; the solution averaged 11 grams of carbonate per litre in frequent tests. Mr. Proctor then suggested that perhaps the time element had not been con-

sidered sufficiently. With low metal concentration solutions as used in barrel plating there was apt to be difficulty with throwing power and that this might be adjusted by proper determination of the time required for plating. He stated that as an electroplater he had always been accustomed to using brass anodes consisting of 80 copper, 19 zinc and 1 tin, each element being strictly high purity metal, and that he had always obtained good results both as to the deposit and the corrosion of the anode. Answering a question, he stated that a 60 copper, 40 zinc mixture was not suitable for use as an anode in brass plating, and that the 80-20 ratio was best in his opinion.

Dr. William Blum, of the U. S. Bureau of Standards, delivered an extemporaneous address. He expressed a high opinion of the speakers who had preceded him and defined research work as the pursuit of the truth. He stated that there could be no cessation of research if progress toward the ultimate truth were to continue, and that regardless of how small the results might be, the constant working toward refined methods would always be profitable. There will always be people to perform the work and concerns and individuals willing to pay for it, if even a trace of reason is presented for research in any direction. Speaking of research as applied to electroplating, he said that it would not make the work of the plater easier; that on the contrary it would become harder. This would be offset, however, by the fact that the increased difficulty of the work would bring with it the compensation of increased interest and greater pleasure in gaining desired results. At the Bureau of Standards he and his associates had worked for three years on nickel solutions. Beside the valuable practical results of this work, he said, not the least useful was the unearthing of a multitude of new and engaging problems in electroplating. He repeated that chemists and platers, as well as those who employed them, would always be increasingly eager to engage in any line of research that appeared even slightly promising. He pointed out that much energy had been expended upon the problems of pH measurement and crystal structure of metals, as shown in the papers by Messrs. Pitschner and Hogaboom, and this was representative of the willingness of experts to see the truth. Polarization is another field for research, he said. In conclusion, he declared that the actual research work is not, generally speaking, to be done by the plater, but by the chemist, metallurgist or other technician. The plater must have the results of this research, its value lying in its definite practical application to plating processes. How the results are obtained is immaterial to the practical plater, but what the results are is his business. He wants to learn to use these results for the improvement of his art. Thus, he urged the chemists to bring their research work as often as possible to a practical stage which can be explained to the plater in definite, meaningful terms. By such co-operation, he said, there was a limitless future in store for the industry.

The meeting was concluded with brief addresses by Dr. Sterling Temple, chief of research, Roessler and Hasslacher Chemical Company, and John H. Feely, of Montreal, Canada, president of the American Electroplaters' Society. The latter expressed his appreciation of the session and urged all members to attend the coming convention of the Society, at Toronto, Canada, stressing the necessity of early reservations at hotels.

Ancient Silver Globe Brought Here

Four hundred years ago Tycho Brahe, one of the greatest astronomers who have ever lived, is said to have employed the best silversmiths of his native country, Sweden, to make a ball for him which would depict in relief upon its surface all the heavenly bodies that were known to exist up to that time. The result of this idea is still in existence in the form of a silver sphere about twelve inches in diameter which has upon its surfaces all the wierd figures of animals, birds and men that the ancients believed to be outlined by the visible formations of the heavenly bodies.

The ball was recently brought to this country to be displayed at the American Museum of Natural History. It was largely through the efforts of Dr. Clyde Fisher, curator of astronomy at the Museum and president of the Amateur Astronomers Association, that the relic, valued at about $108,000, is now being exhibited to the American public.

Dr. Fisher stated recently to a representative of THE METAL INDUSTRY that the antique has had a glorious history, passing from hand to hand and being treasured in Sweden as one of the country's most precious possessions.

Its latest owner is Baron Sigfrid Ralamb, Swedish nobleman, who inherited the ball and who is said to have received a special dispensation from the King of Sweden to bring the ball to America.

There was considerable opposition in Sweden to having the ball leave the country. There were, in fact, rumors that the ball might be sold while it was out of the country.

The illustration on this page is reproduced by courtesy of the Amateur Astronomical Association and the American Museum of Natural History.

THE TYCHO BRAHE ASTRONOMICAL GLOBE

Annual Meeting of Newark Electroplaters

Banquet and Technical Session on April 14 Brings Together Many Platers — Good Program of Papers

The attendance at the day's activities was greater even than the arrangement committees had expected. There were more than 250 members and guests at the technical session, while the banquet attracted 471 persons. Prizes were distributed to holders of "lucky number" tickets, Joseph McNamara, of 7 Thomas Street, Newark, winning a Ford automobile with a ticket costing 39 cents. There was dancing after the banquet and in all it was one of the most successful functions the Newark Branch has ever had.

The annual banquet and technical session of the Newark Branch of the American Electroplaters' Society was held on April 14 at the Elks Club, Newark. There was no change from the Newark Branch's usual practice of presenting a highly important and interesting program of papers on various phases of the electroplating art, and, also as usual, there was no dearth of listeners.

After delivering his address of welcome, Charles H. Bohler, president of the Branch, turned the meeting over to George B. Hogaboom, chairman for the technical session, who introduced the speakers, as follows:

Charles H. Proctor, Research Engineer, Roessler and Hasslacher Chemical Company, New York, and Plating-Chemical Editor, THE METAL INDUSTRY, discussed **Chromium Plating—Its Present and Future.** Mr. Proctor was very optimistic regarding the future prospects of this branch of the industry, regarding chromium as one of the brightest spots there have been on the plating horizon in a long time. He declared that in the technique of chromium plating, not only the composition of the solution was important, but also the electrical, mechanical and temperature control methods. A review of the patent history of chromium plating, he said, indicated that practically all commercial chromium solutions today are based on chromic acid, chromic sulphate and chromate of iron; such solutions, he added, can be kept up by additions of chromic acid and sulphuric acid.

Oliver J. Sizelove, Instructor of Electroplating, Newark, N. J., Vocational School, also spoke on chromium, describing a number of experiments in chromium plating which were made by the students, who used the Haring formula, with variations in temperature of solutions, composition of anodes, anode area, current density and voltage. The solution used was chromic acid, 33.5 ozs. per gallons and sulphuric acid, .33 ozs. per gallon. Results were checked and divided into classes. Mr, Sizelove displayed samples.

In the general discussion of chromium plating methods, it was stated at the session that immersion of work in the chromium solution in a wet state from mild alkaline cleaners and a water wash had proved to be good practice; others, however, maintained that better results were obtained by immersing dry work in the plating solution.

Dr. Hiram A. Lukens, Professor of Electrochemistry, University of Pennsylvania, discussed the results of experiments performed in chromium plating in his laboratory. He stated that he had checked the Haring formula and also the experiments of the Bureau of Standards experts, and had confirmed their results. He stated that he had found the simple chromic acid, sulphuric acid solution equal to the others, including the more complex formulae. His experiments indicated the following as the proper proportions for a chromium solution: Chromic sulphate, 3.3 grams per litre; chromium content, .87 grams per litre. The trivalent chromium concentration must be kept down to about .87 g/l, he said, or poor deposition would result.

Dr. William Blum, of the Bureau of Standards, told the sessions that the Research Fund of the American Electroplaters Society has appointed a new Research Associate, Mr. Farber, who will work on the properties and applications of chromium plating. Mr. Farber was previously associated with Mr. Vanderau, at the laboratories of the Westinghouse Electric Products company, Mansfield, Ohio.

Relative Merits of Sodium and Potassium Cyanides in Silver Solutions, Containing Varying Amounts of Carbonates, a paper, was read by George B. Hogaboom, Jr., of Columbia University. Mr. Hogaboom found that potassium cyanide solutions were superior to sodium cyanide solutions when compared for anode and cathode efficiency, current density, solubility of carbonates, anode corrosion and appearance of deposit. Mr. Hogaboom was commended for the preparation of his paper.

Electrodeposition of Nickel on Aluminum, a paper, was presented by Harold Work, Research Fellow, Aluminum Company of America. He described the preparation of various aluminum compositions for electroplating. The dip preceding immersion in a plating solution, he said, is the most important phase of this work, various alloys requiring different dips, there being no single dip which is applicable to a number of alloys of different composition. He found that die-cast aluminum could be dipped in a bath of concentrated nitric and sulphuric acids. A report of this paper in full or in abstract will appear in a later issue.

Welding Copper

Q.—Can you furnish us full information regarding preparation for welding copper, as well as the method?

A.—The preparation of copper for welding is the same as for steel. Owing to the high conductivity of copper, however, a blowpipe about two sizes larger than for steel should be used. It is necessary to apply heat liberally, in order to have a high temperature that will melt the copper quickly without oxidation. To obtain a constant heat at or near the weld, it is advisable to preheat the metal. In small jobs this can be done in a charcoal fire, but on large work greater success may be assured by having a blowpipe flame near the weld to supply the heat.

The welding rod should contain a liberal amount of phosphorous, which acts in the same manner as the flux used in welding cast iron, and deoxidizes the metal. A welding rod of the same composition as the base metal will be found unsuitable as it will make a porous, weak weld.

After the weld is made and cooled it is left in the cast condition, i.e., the grain will be coarse and separated from the part sufficiently to lower the tensile strength of the metal. It is good practice to heat the metal to a dark red (not too high a temperature) and to hammer it. The weld should then be heated to a red heat and annealed by plunging in water or quickly cooling by air.—P. W. BLAIR.

The Development of the Aluminum Industry

Its Growth from a Laboratory Curiosity to a Great Manufacture—Conclusion.*

By ALUMINUM MAN

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

Permanent mould cast cylinder heads are also in use. The chief advantage of an aluminum cylinder head lies in its thermal characteristics which permit the use of high compression with resultant higher efficiency. Obviously, the use of an aluminum piston and an aluminum cylinder head on the same engine is an ideal combination and will give you a high type of motor performance and efficiency.

There are many other uses for permanent mould castings such as bearing caps, automobile door pillars, cooking utensils, etc., etc.

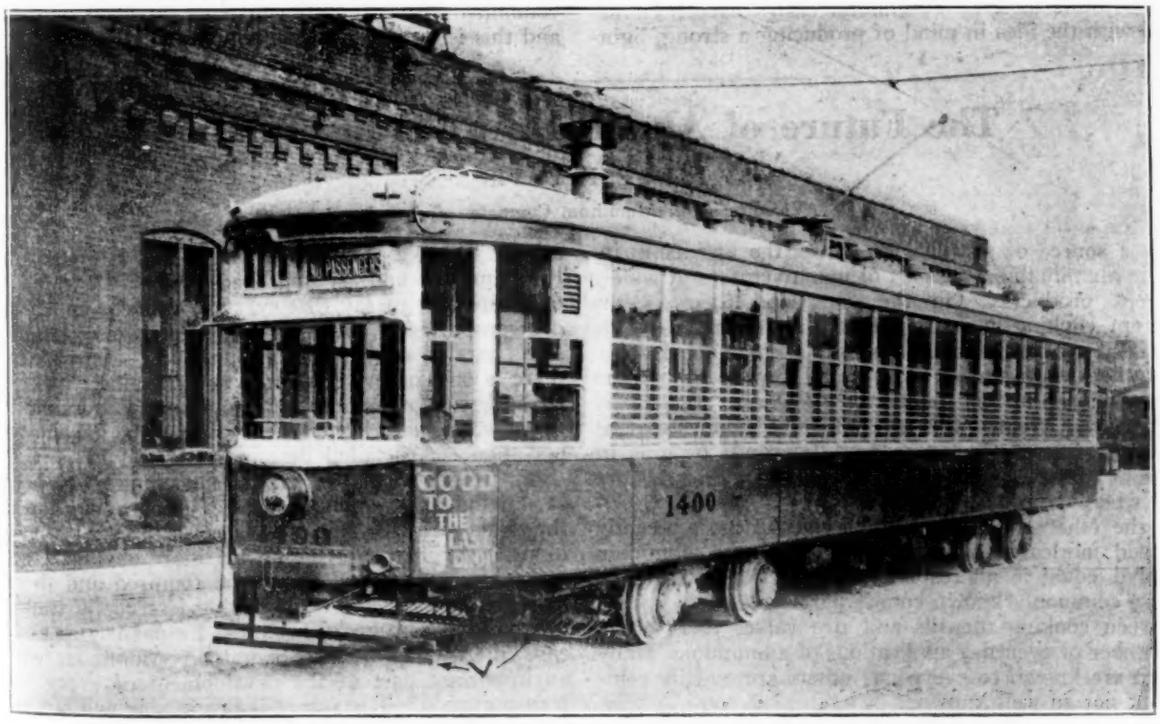
Aluminum strong alloys can also be forged. Probably the most outstanding development of such forgings are the aeroplane propellers which are now so extensively used, not only in the Army and Navy, but by commercial planes as well. Probably everyone knows that the propeller used by Colonel Lindbergh in his flight from New York to Paris was of forged heat-treated aluminum. Strong alloy forgings are also found in other places not only in aircraft motors, but also in automobile engines. Some of the outstanding uses are for crankcase sections, tachometer couplings, intake flanges, crankcase cover plates, magneto gears, aeroplane brake levers, supercharger impellers, etc., etc.

Forged aluminum connecting rods are coming into more and more widespread use. They are light and strong, and when used in conjunction with aluminum pistons make possible greatly increased engine efficiency.

Possibly one of the most significant things insofar as aluminum is concerned is the great interest shown in it by those manufacturers who make or operate transportation of one sort or another, whether it be railway cars, street cars, buses or automobiles. In November of this year a light weight car, built by the Cleveland Street Railway, rounded out some 32,000 miles of regular service on the streets of Cleveland. This car weighs something like 30% less than its counterpart in steel and over the ten-month period just mentioned has demonstrated that it requires aproximately only 22% as much power to operate it as the same car in steel. This car is carefully examined from time to time and none of the aluminum parts going into its make-up have shown the slightest failure or indication of failure.

Those who attended the A. E. R. A. Convention in Cleveland this year were undoubtedly impressed by the many applications of aluminum in the electrical and particularly in the transportation field. The Chicago & Joliet Railway designed a car with the idea in mind of using aluminum in its construction as much as it was possible to do so. Aluminum was used, not only in the construction of the car itself, but for the auxiliary equipment such as lighting fixtures, anti-climbers, trolley poles, seats, fare boxes, brake levers, etc. The car body itself weighs approximately 10,500 pounds in comparison with a steel body of the same general design weighing 22,000 pounds. The completed car was found to have a weight per seated

* Parts 1 and 2 were published in the issues of March and April, 1928.



ALUMINUM CAR USED BY UNITED RAILWAYS OF ST. LOUIS. SAVING IN WEIGHT OVER SIMILAR STEEL CAR IS 14.3%. WEIGHT SAVING IN BODY ALONE IS 21.4%

passenger of 474.4 pounds as against approximately 900 pounds per passenger in the present type of car.

Recently the Chicago & Northwestern Railway Company placed in operation 120 new light suburban coaches. In the construction of these cars something like 500,000 pounds of aluminum was used. While the weight saving amounts to only aproximately 7%, nevertheless the total saving in a maximum train of 10 cars is some 70,000 pounds. This is sufficient to obviate the necessity of having to purchase new locomotives and the old ones are being retained in service. As a matter of fact, the weight saved in a maximum train is equivalent to a decrease of 3,500 pounds in tractive effort necessary to accelerate. This decrease in tractive effort represents a 20% reduction over the ordinary tractive effort.

The use of aluminum is not only indicated in construction of railway cars, but can also be used in locomotives. The Alton & Southern Railroad has had in service for several years two locomotives which are equipped with quite a number of aluminum reciprocating parts such as eccentric rods, radius bar lifters, combination links and levers, side rods, back rods, valve rods, cross heads, etc.

There are many other special applications for aluminum due to the fact that it can be very highly fabricated. An illustration in point is the manufacture of aluminum collapsible tubes, the demand for which is constantly increasing. There is no doubt that aluminum tubes will continue to be used more and more by manufacturers of products marketed in this type of container. The only place where aluminum is not indicated is in the case of a few products which because of their chemical composition react disadvantageously with aluminum.

The development of aluminum furniture was brought about by two things. One, the perfection of strong aluminum alloys and the other, the perfection of the technic of welding alloys. Aluminum furniture combines the advantages of the light weight of aluminum and the strength of mild steel. Aluminum chairs are not only strong and light, but they are fire-proof and they will never warp nor the joints loosen. Aluminum chairs have been designed with the idea in mind of producing a strong, lightweight, fire-proof chair of quality, at a price which is comparable to the prices for the best wood chairs. The temperature at which the chairs are heat treated is also a good temperature in which to bake on the finishes in which the chairs are produced. This finish is extremely durable and is supplied not only in plain colors, but also in natural wood grains. The finish resists defacement by alcohol, lighted matches or boiling water. One of the earliest installations of aluminum furniture was in dining cars of some of the railroads in this country. The advantages there and also in hotels and institutions are obvious.

It is not only possible to obtain aluminum chairs for your office, but one can also get aluminum file guides in a large variety of sizes, shapes and styles. An aluminum file guide is practically indestructible.

Other highly complicated forms of aluminum are seals and bottle caps. Large quantities of aluminum are now being used in the manufacture of mason jar caps where they are particularly efficient.

Much special industrial equipment is fabricated of aluminum. Parts are supplied to manufacturers of chemicals, by-product coke plants, textile mills, rubber manufacturers and many others. The variety of this special work is endless and no two jobs are the same so that much ingenuity in engineering, design and execution must be brought into play to accomplish the desired end.

Aluminum is, of course, used in many places and for many things which have not been enumerated hereinbefore. It would be almost impossible to list the myriad applications for aluminum. The most interesting part of the metal is the fact that in spite of the many places where it is now found there are just as many more where it will be put to work eventually. The surface has just been scratched, and while tremendous forward strides have been made during the past forty years, the next forty years will make them seem almost insignificant. In every line of endeavor the constant aim is toward increased efficiency. In many enterprises increased efficiency can be obtained by light weight, and when that light weight is combined with strength you have an ideal combination, and this is provided by aluminum and its alloys.

The Future of Aluminum in Transportation

By E. K. DAVIS

Vice-President, Aluminum Company of America

It is a source of gratification to see the increasing interest in aluminum on the part of manufacturers of widely divergent products. On the one hand there is the aluminum cooking utensil industry, an example of the earliest fabrication of aluminum on a commercial scale. Twenty-five years ago or more there were no aluminum cooking utensils in this country or elsewhere. A demand for them was created through intensive selling so that now this industry alone consumes thousands of tons of aluminum each year and aluminum cooking utensils are found wherever cooking is done.

On the other hand there is one of the most recently developed fabricated aluminum products,—the aluminum tire valve, equal in all respects and superior in many to its more commonly known counterpart.

Between cooking utensils and tire valves there are a vast number of everyday applications of aluminum. Many of them are known to everyone; others are equally common but not so well known.

Everyone from his earliest years to old age is dependent upon transportation. Regardless of its character, every known mode of transportation can be and is built around the idea of the light weight and strength afforded by aluminum and its improved alloys. It would be an overstatement to say that every manufacturer of vehicles of transportation, whether baby carriages, automobiles, street cars or airplanes, uses aluminum. But in each class there is one, or more, manufacturer availing itself of the advantage of aluminum and its alloys. Everyone knows the advantages of light construction in the media of transportation. A detailed description would be superfluous. Light weight means less power consumption, greater ease in starting and stopping, a larger pay-load by the use of the same size of vehicle and, especially, the advantages of light weight reciprocating parts are obvious.

Transportation will always be required and there will always be an incentive to provide less costly transportation coupled with greater comfort for passengers and more ease in handling for the operator. Aluminum will play an important part in the development of every kind of transportation. The future is bright. It will not be long before what may seem today to be a bold departure from previous practice will be looked upon as the only logical and rational engineering design.

THE METAL INDUSTRY

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Editorial

Copper Alloys

We are accustomed to new and even revolutionary ideas which involve new elements. It does not astonish us when new alloys of aluminum are announced or when extraordinary properties are obtained in steel by using new addition agents. But there is something surprising in the fact that copper, one of the first known metals, and about which more has been known for a longer time than almost any other, has lent itself to strikingly new and useful alloys.

In a recent speech before the Institute of Metals Division, William H. Bassett, of the American Brass Company, described the alloys of copper, old and new. He pointed out that the use of silicon had led to two new types of copper alloys. One is known as Everdur with the formula copper 94.4, silicon 4.5 and manganese 1.1 for castings, and copper 96, silicon 3 and manganese 1 for rolling. The other is the Corson alloy, which can be hardened by heat treatment. It has the approximate formula, copper 95, nickel 4, silicon 1.

It seems that the first to suggest the use of silicon in copper was Erwin S. Sperry in 1905. At that time, however, no one could get silicon into copper to the extent of more than a fraction of a per cent. Silicon was used therefore, only as a deoxidizer in the copper-tin bronzes.

Copper has recently assumed new importance in other ways. New industries have opened to it and old industries have expanded greatly. The electrical industries, of courses, needed no persuasion to use copper as it has always been pre-eminently the most suitable material, and the best electrical conductor at a reasonable price. The automobile industry raised its requirements from 70,000,000 pounds in 1921 to 250,000,000 pounds in 1926, an increase of 350 per cent in five years. The building trades are now using brass pipe and fittings to replace plain or zinced iron. Even the lightning rod is now coming back into its own and took 18,000,000 pounds in 1926. New uses are varied and diversified. Copper radiators are now being made and copper hardware is gaining daily.

The lesson is perfectly clear. It is not necessary to go far afield to make improvements, or to look for materials which have never been seen before. If there are possibilities in a metal which has been known for so many thousands of years as copper, the field is wide open for new inventions in other metals and alloys.

Standard Descriptions for Gold

A short time ago, the Birmingham (England) Jewelers' and Silversmiths' Association undertook a metallurgical investigation to discover any means of distinguishing between rolled gold and gilt goods. In the report of this investigation, definitions were specified for "rolled gold," "gold-filled," "gold shell," "gold cased," "gilt" and "fire or mercurial gilt." The report is the latest step in a campaign of education by the above-mentioned trade body and two others in England to standardize practices in a field which has long needed it.

These associations did not rest there, however, but drafted a bill to legalize their findings and at this time are pressing it steadily in Parliament to get it on the statute books. The bill will include not only standard trade terms and definitions, but also methods of testing.

We recommend this procedure to American jewelers and perhaps also to metal manufacturers in general who are in the business of supplying products which go in unchanged form to the public. In this country we suffer greatly from the misuse of nomenclature and the obscurity of trade terms. Part of our troubles are caused by carelessness and the desire for individuality; some, by an actual intent to deceive. The market has been flooded with a large number of miscellaneous alloys and a wide variety of products made under different methods of manufacture. Many of these may have a legitimate appeal and a place for themselves, but under no circumstances should products and processes be so named as to confuse them with others of a higher grade of usefulness. A thorough overhauling of trade terms in the jewelry and metal industries and the impression of these corrected names on the consuming public would be a boon to producers and consumers alike.

The Foundryman's Function

The foundry business has peculiarities which differentiate it from most of the other manufacturing industries. As a rule, a manufacturer sells a commodity which he makes up and supplies to the market at a price set by himself if he has a specialty, or by competitive market conditions if he is making a staple article.

The jobbing foundry, as a rule, has no product peculiar to itself. It makes castings for the trade, conforming to specifications laid down by the purchaser. In other words, the foundryman does not sell a commodity as such, but his technical ability to make parts for others who are not so well equipped. Basically, therefore, the foundryman sells service—a casting service—and it is for his knowledge and experience that he is paid.

To be sure, he must charge for metal as he has to pay for it, just as he must figure in the price the cost of gas, rent and other items. But metal can be purchased from other firms. As a matter of fact, some customers prefer to buy their own metal and have the foundry charge simply for making castings.

Surprisingly few foundrymen realize that their business is essentially one of service rather than manufacturing. While such a conception may seem to be unimportant or academic, it has a direct bearing on the foundryman's attitude. Instead of considering himself a quantity producer and operating his business in the same way as a manufacturer, he should look upon himself in the light of a specialist and expert whose business it is to aid his customer with technical information and advice. The average user of castings knows only the results that he wants to achieve; he does not know how to get them. He goes to the foundryman and says, "I want a casting with such and such properties. What alloy shall I use?" If the foundryman is an expert he will recommend aluminum-silicon, manganese bronze, or anything else that the

situation calls for. He may point out improvements in the design of the part to be cast. In order to do this, the foundryman must be thoroughly conversant with developments in metals and alloys. He must be wide awake and progressive, and also willing to experiment occasionally in his plant.

What will be the result of giving service of this kind to customers? A direct charge is, of course, out of the question as this is obtainable only by consulting engineers who operate under that title. Nor is it particularly desirable, as the value of such co-operation is seldom possible to determine accurately. What it does do, invariably, is to pre-dispose a customer toward the foundryman who helps him. The purchaser says to himself, "Here is a good man. He knows his business and he is willing to work with me. I am glad to pay him a fair price because I know that he will make good and it will pay me better than to take the lowest possible competitive bid, where I am not sure of getting service."

The bane of the foundry industry is the over-severe competition which results in cut-throat prices. The foundryman is wise in the long run, who forces his competition along the lines of service as a casting specialist, rather than by cut prices as a cheap manufacturer.

Airplane Expansion

The airplane industry does not yet bulk very large in comparison to other great manufacturing industries in the United States, but it has attracted more public attention than any other because of the romance attached to it. Nevertheless, it is being watched and followed with a careful eye by everyone engaged in the manufacture of metals. The science of flying is moving too rapidly to be ignored and the increase in the use of metals, aluminum, brass and bronze in this field is too sharp to be overlooked, even though the total quantities involved are still comparatively small.

What is needed for airplane building to become a great industry? Only one feature—Safety. It is not enough to say that automobiles are also subject to accident, nor can this objection be answered by pointing to air mail fliers whose percentage of accidents is almost negligible. Automobile accidents loom up in actual numbers, but not in proportion to the total number of machines in existence. Airplanes will be flown eventually by the public at large and for that reason must be made at least as safe as the automobile, if they are to be taken up in similar fashion.

A recent report from London tells of the invention by Captain De Haviland, of a new safe or foolproof plane. It seems that slots are placed in the wing tips which open when the machine begins to drop into a nose dive. The machine is then steadied, comes to a proper level position and falls at a slow rate, about nine miles an hour. While this was enough to break fusilage and the wings, in the test conducted by De Haviland, he emerged unharmed.

Other tests are reported, one of which is a little too much for even our imagination, inured as we are to the startling inventions. The plane was said to have been deliberately flown into the ground without the least attempt to flatten it out. De Haviland put the machine into a fairly steep glide and aimed it at about the middle of the landing area. It struck the ground at 65 miles an hour, but the undercarriage absorbed the shock and the machine only bumped mildly. Believe that if you can.

As we see it, with planes now able to fly at 300 miles an hour, with endurance records of well over 50 hours, the time is ripe to concentrate on what always has been the most important consideration—Safety. We commend this factor to the attention of the plane builders.

Will Welding Replace Riveting?

A recent news item states that a new steel frame factory building being erected by the General Electric Company in Philadelphia, will be welded instead of riveted. Welding of steel structures was thought of long ago, but only recently has this practice been brought to a point where it was thought safe to try it in actual operations. The Westinghouse company has put up such buildings and now the large electrical manufacturers are actively pushing welding equipment for structural purposes. The building under construction by the General Electric Company is approximately 140 ft. wide, 600 ft. long and 50 ft. high. It is obviously no small sized experiment.

It is stated that the labor cost of welding a structure is no higher than that of riveting. The savings are made in the metal, said to be 12 to 15 per cent in the case of the building mentioned above. Add to this the saving in the nerves of the people who have been forced to listen to a riveter at work and we have an improvement which is hard to calculate.

It is safe to predict that welded structures will grow in popularity.

Platers Should Study Metals

There is an age old argument in every plating shop, small or large. Who is responsible for the spoiled work? The plater, or the manufacturer of the base metal? There is no one answer to this question as conditions may vary a dozen times a week within the same plant.

Mr. George B. Hogaboom proposed an interesting solution to this problem in his talk before the Bridgeport Branch at their recent annual banquet. (See this issue of THE METAL INDUSTRY, page 214.) He stated that platers must learn something about the metal over which they plate. Is the article sound or is it porous? Is it homogeneous or is it spotty? Is it under internal stresses which will cause it to warp thus disturbing the plate?

This suggestion opens a wide field for inquiry and discussion. Obviously, it is not meant that the plater should become an expert metallographer. Plating itself has enough troubles to occupy a lifetime without the addition of new ones. A plater should, however, understand the basic constituents of the metals with which he must work, and know enough to be able to trace the cause of trouble when it does occur, in order to prevent it from recurring.

Just what form this type of education should take is not altogether clear at this time, but we commend it to our readers as a fertile field for further thought.

At the Foundry Convention

The 32nd annual convention of the American Foundrymen's Association will be held during the week of May 14th in the Commercial Museum, Philadelphia, Pa. This bare statement should be enough to make all foundrymen set aside that week for Philadelphia.

A glance at the program will prove the value of attendance at this convention. A brass foundry round table, papers on refractories, casting and gating problems, melting temperatures, foundry management, apprentice training and materials handling are only some of the features prepared. The exhibits, which have not been held since October, 1926, will have freshness and originality.

The equipment exhibits are now being held every two years instead of annually and for that reason it is doubly important to attend them. There will be a solid week of new ideas in the meetings, and new devices among the exhibits, awaiting all those who have the foresight to attend the Foundrymen's convention.

New Books

Atlas Metallographicus. By Hanemann and Schrader. Published by Verlag von Gebrüder Borntraeger, Berlin, W. 35, Schoneberger Ufer 12a, Germany.

The Metallography of iron and steel has enjoyed about 50 years of successful and ever-growing progress. Thousands of photomicrographs pertaining to various shapes and states of iron carbon alloys have been published in a great number of magazines. But still there was heretofore not even a single attempt made to present the whole aspect of micrometallography of these alloys step by step for the use of the student and the practical metallographer. Now, due to the painstaking efforts of Dr. Hanemann and Miss Schrader, we are in possession of at least two fasicles of an Atlas which promises to fill up the existing gap in the most complete manner. Thus far, the authors have published only the first sixteen pages. These give an exceedingly fine pictorial presentation of the structures of iron carbon alloys containing up to 1.5% carbon in the forged state and after a normalizing treatment.

The first two issues contain 121 individual pictures taken at magnifications ranging from 40 to 1200 diameters. All pictures are quite clear and very instructive. It is possible to expect that the next issues will show the structures of the heat treated alloys in the same complete manner. Again, it may be expected that after giving a complete presentation of iron carbon alloys, the authors will succeed in doing the same for the most important non-ferrous metals and alloys in their different states.

The only drawback we notice thus far is the complete absence of photomicrographs representing iron carbon alloys in their cast state. The latter, while not presenting the normal features of the alloys, gives even a much better insight into the physico-chemistry of processes taking place in alloys and even a good knowledge of the features of metals and alloys in the wrought state will not help the future metallographer much if he does not in time acquire a clear understanding of the structure of the ingot.

At any rate, Dr. Hanemann and Miss Schrader, have undertaken a very important educational job and we must be thankful to them for their efforts and extend to them our best wishes for complete success.—M. G. Corson.

Journal of The Institute of Metals. Vol. 38. Published by The Institute of Metals in Great Britain; edited by G. Shaw Scott. 813 pages. Price, 31s. 6d. net.

The latest half-yearly volume of the Journal of the Institute of Metals constitutes another useful contribution to Metallurgical literature. The fourteen original communications that it contains were presented at the recent Derby Meeting of the Institute, and to each is appended a verbatim report of the discussion that took place at the meeting and subsequently by correspondence. The result is a very helpful set of papers dealing with such practical subjects as "Non-Ferrous Metals in Modern Transport," "Grain Growth in Compressed Metal Powders" and "The Protection of Aluminium and its Alloys against Corrosion."

More than half the Journal is devoted to abstracts of papers of metallurgical interest. The Journal is printed, illustrated and bound in good style.

National Electrical Safety Code. Bureau of Standards, United States Department of Commerce. 525 pages. Price, $1; available from Superintendent of Documents, Government Printing Office, Washington, D. C.

This is the fourth edition of Hand book No. 3 of the series prepared by the Bureau of Standards. It is a revision of the standard issued by the American Engineering Standards Committee, the revision being carried out by two large sectional committees including delegates from all interested organizations, such as associations of utility companies, manufacturers, electrical workers, inspectors, insurance underwriters and technical men, as well as administrative officials. It contains complete rules for installations, maintenance, construction and operation of all sorts of electrical lines, apparatus, machinery, etc. Accident prevention is covered.

Protective Metallic Coatings. By Henry S. Rawdon. Published by the Book Department of the Chemical Catalog Company, Inc., New York City. 277 pages. Price, $5.50.

This book, No. 40 of the Monograph Series of the American Chemical Society, covers an important phase in metallurgy. Metallic coatings for protection against corrosion are being given increasing consideration, and this is now the only authoritative treatise on the subject, the only other one having been withdrawn several years ago because of obsolescence. The book deals with every means of metallic coating, and Mr. Rawdon, who is senior scientist in metallurgy at the United States Bureau of Standards, has treated his subject in a competent and intelligent manner. Naturally, since prevention of iron and steel corrosion is mainly being sought, this aspect of the coating problem is constantly given attention throughout the book. A great deal of thought has been devoted to topics pertaining to electroplating and chemical treatment of metals, iron and steel. The author has drawn on all available sources of information; especially upon the results of work done by himself and his colleagues at the Bureau of Standards.

He has attempted to discuss those characteristics and properties of the various types of metallis coating which determine the usefulness of such coatings, as well as their limitations, in the hope that the book might be of some value and interest to the non-technical reader as well as to the specialist in metallurgy or chemistry. The essentials of the various coating processes have been given, since the characteristics of any coating, and sonsequently its usefulness, are often determined in very large measure by the process by which it was produced. Nearly all of the investigative work on the testing of metallic coatings has been devoted to zinc coatings, since this class is used so extensively, and is so important from the industrial standpoint.

Standards of the American Society for Testing Materials for 1927. Published by the American Society for Testing Materials, Philadelphia. Two volumes. Size 6 x 9, 871 pages and 1000 pages respectively

This is the triennial publication of the American Society for Testing Materials. Volume 1 covers metals and includes a large number of standards, non-ferrous metals, metallography, testing methods and zinc coated products.

The Society has also issued a bound index of its procedings from 1921 to 1925 inclusive. This index is available at $2.50 in cloth and $3.50 in half-leather binding.

The Society has also issued a volume of tentative standards for 1927, 6 x 9, 824 pages. It contains 20 tentative standards relating to non-ferrous metals. Price is $7.00 in paper and $8.00 in cloth binding.

Transactions of the American Foundrymen's Association, 1927. Edited by Robert E. Kennedy. Published by the American Foundrymen's Association, Chicago, Ill. Size 6 x 9, 484 pages.

The thirty-fifth volume of the transactions of the American Foundrymen's Association has just been published. It covers the activities of the Association during the 1927 year, including detailed reports of the important meetings, the annual banquet, and awards of prizes, as well as all of the technical papers for the year. There are 458 pages of material relating directly to the technique of foundry work. The regular reports of the Association's various committees are given. The book itself is nicely bound, conforming with its predecessors in both size and excellence of content. It was edited by Robert E. Kennedy. There is a frontispiece portrait of S. W. Utley, President of the organization.

Iron and Steel. By H. M. Boylston. Published by John Wiley and Sons, Inc., New York. Size 6 x 9, 571 pages. Price $5.00.

In this work, which is designed as a text for students as well as for the edification of those interested in the iron and steel industry generally. Professor Boylston has made a competent outline of the history and development of the ferrous industry. He has reviewed their background, from antiquity to the present

and has shown the growth of what has become one of the world's most important basic industries. It covers the chemistry and metallurgy of iron, the methods of manufacture and the varied uses of these products. It is profusely illustrated and should provide a very useful introduction to this complex field. Practically every phase is described, frequently in detail, always intelligently.

The **Technique of Vitreous Enameling.** By J. E. Hansen. Published by The Ferro Enameling Company, Cleveland, O. Size 8½ x 5¾; 200 pages. Price $3.50.

A volume devoted to processes of sheet steel and cast iron porcelain enameling by the wet process. Illustrated by half-tones and charts, together with tabulations of data. Outlines a complete course of action for a well-regulated shop. Colors and color matching together with mill additions and percentages are explained.

The **"Mechanical World" Electrical Pocket Book, 1928.** Published by Emmott and Company, Ltd., Manchester, England. Size 4 x 6¼; 338 pages. Price, 1s. 6d., net.

A collection of electrical engineering notes, rules, tables and data. This is the twenty-first year of the publication of this handy volume for electricians, engineers and industrial executives..

Mineral **Resources of the United States, 1924.** Part I, Metals. Edited by Frank J. Katz. Published by the Bureau of Mines, United States Department of Commerce, at the Government Printing Office, Washington, D. C. Size, 6 x 9; 589 pages. Price, $1.

This book intelligently sets forth the country's metal production, imports, exports, and, in some cases, treats of the markets for them. It is a highly useful work.

Proceedings of the American Society for Testing Materials, Vol. 27. Part I, Committee Reports; New and Revised Tentative Standards. Part II, Technical Papers. Size, each 6 x 9; 1142 pages and 564 pages, respectively. Published by the Society, at Philadelphia, Pa.

These two volumes give a comprehensive view of the work during 1926 of one of the country's most important reseach and standards organizations. A great deal of its work is devoted to metals, which, consequently, take up a large part of the two works under review.

Handbook of Chemistry and Physics. By Charles D. Hogman and Norbert H. Lange. Published by the Chemical Rubber Publishing Company. Size 4¼ by 6½. 1112 pages. Price $5.00.

This is the 12th edition of a handbook which has been growing steadily with each imprint. The first edition was published in 1914 and succeeding editions followed in rapid succession.

A glance at the following list of tables will show the space devoted to metals and alloys:

Composition and properties of alloys.
Densities of metals and their alloys.
Tensile strength of metals.
Hardness of materials, including all metals.
Surface tension of fused metals.
Specific heats of metals and their alloys.
Coefficients of thermal expansions of metals and alloys.
Electromotive force series of metals.
Melting and boiling points of metals.
Melting points of mixtures of metals.
Heat equivalents of fusion of metals.
Heat conductivity of all metals.
Contact difference of potential of metals.
Properties of metals as conductors.
Resistivity of metals.
Magnetic constants of iron, steel and other metals.
Wave lengths of principal lines of metals.
Optical constants of metals.
Reflection of light by metals.
X-ray spectra of metals.

In addition to these special tables, there is information about each element, a scheme of rapid qualitative analysis, directions for the preparation of laboratory reagents, physical and chemical properties of 2,000 inorganic and 3,000 organic compounds, and a solubility table of 375 common inorganic compounds in water for each 10 degrees from zero to 100 degrees C.

The handbook is unquestionably a compilation of great value to metallurgists and metallurgical chemists. Of course, all of the material can be found elsewhere in one form or another, but the collection of data between two covers is such a help in making a research that it is often worth while to duplicate material for the sake of having it easily available.

Technical Papers

Electric **Heating and Electric Welding,** by C. L. Ipsen. A paper presented at the 43rd Annual meeting of the Association of Edison Illuminating Companies, at Colorado Springs, Colorado, September 26-30, 1927.

A discussion of the relative costs of electricity and fuels for industrial heating brings out the fact that there is a broad field of application where the use of electricity is economically sound.

An idea of the possible extent of industrial electric heating is gained from data showing the heating load of the General Electric Company's plants. The energy consumption by electrically heated devices, most of which have been added during the past eight years has already reached a figure of 80,000,000 kw-hr. annually. This is equal to over one-third of the combined power and lighting load. Most of the heating devices operate at unity power and many operate during off-peak periods.

Electric equipment has been fully developed for most industrial heating processes, including:

1. Steel Melting and Treating
2. Brass, Copper and Aluminum Melting and Annealing
3. Vitreous Enameling
4. Copper Brazing
5. Glass Annealing
6. Compound Melting and Treating
7. Baking of Metal Finishes, Cores, Insulations, etc.
8. Baking of Bread and Other Food Products
9. White Metal Melting
10. Water Heating and Steam Generators
11. Heating Soldering Irons, Hot Plates, Shoe and Cigarette Making Machines, Glue Pots, etc

Electric welding is of interest because of its influence on the designs and manufacturing economy of such equipment as electrical and power machinery, pipe lines, buildings, tanks, etc. The substitution of electric welding for riveting and the substitution of welded structures for cast iron and cast steel are going forward at a rapid rate. Two recent developments, the automatic arc welder and the atomic hydrogen welder are described.

Effect of the Testing Method on the Determination of Corrosion Resistance. By H. S. Rawdon and E. C. Groesbeck. Technological paper No. 367, of the Bureau of Standards, Washington, D. C.

For the purpose of obtaining comparative data on the effects produced by different testing methods upon the determination of corrosion resistance of metals, tests were carried out on a copper-nickel series, consisting of copper, nickel, and three copper-nickel alloys, all of commercial grade. The testing methods tried out were simple immersion in non-aerated and aerated solutions, repeated immersion—both continuous and intermittent—spray, and an accelerated electrolytic test. The corrosive solutions employed, all of normal strength, were hydrochloric and acetic acids, sodium and ammonium hydroxides, sodium chloride and potassium dichromate (used as an oxidizing agent).

A few supplementary simple immersion tests were made in which nitrogen gas replaced air for agitating the solution. The corrosion rate and the order of relative corrodibility of the five materials were found to vary very considerably for different test methods employed in the experiments by Messrs. Rawdon and Groesbeck.

The results clearly indicated that the essential features of the service to be met should be incorporated in any corrosion test designed to give information concerning the suitability of a metal for some particular type of service.

The Surface Tension of Molten Metals. By Earl E. Libman. Bulletin 173 of the Engineering Experiment Station, University of Illinois, Urbana, Ill. The paper states that the forces acting upon multen substances are gravity and the intermolecular attraction which manifests itself in the phenomenon of surface tension, so that it follows that the behavior of the molten materials will be closely related to their surface tensions and that an extension of our knowledge of this property should lead to a greater insight into the peculiarities exhibited by molten metals. This paper has therefore been prepared as the result of an investigation to determine surface tensions of a large number of molten metals. Apparatus and methods are outlined in the bulletin and a chapter is devoted to determination of the capillary constant of copper. Copies may be obtained free from the Engineering Experiment Station.

Commercial Testing and College Research Laboratories. Miscellaneous Publication No. 90 of the United States Bureau of Standards. 46 pages, size 7½ x 10½. Sold by Superintendent of Documents, Government Printing Office, Washington, D. C. Price, 15 cents.

This is the second edition of this directory, revised to December 6, 1927. It gives a comprehensive list of the testing and research laboratories in the United States where commercial work is done. The list was prepared due to the large amount of work the Bureau of Standards has been offered by private individuals and concerns. The Bureau prefers to do only such work as cannot be done in other laboratories.

Technical Information on Aluminum Bronze. Aluminum Bronze Manufacturers' Institute, 810 Eighteenth street, Washington, D. C.

This booklet has been prepared for the purpose of supplying information about the commercial aluminum bronzes in such form that the user will be able easily to select the particular type of material suited to his requirements. It contains valuable data, including some good charts and tabulations of the properties of various aluminum bronzes.

Metal Recovery from Bronze Foundry Slags, by Ernest R. Darby, Toledo, Ohio. Institute of Metals Division, A.I.M.E., New York.

When bronze is melted in an open-flame furnace a considerable amount of slag is formed that contains metal both mechanically admixed and chemically combined. Unless kept separate from other foundry waste important amounts of metal may be lost. The results obtained by the blast-furnace retreatment of slag at one foundry are given; the saving in one year was $13,000 more than the total cost of the furnace. Foundries that melt only small amounts of bronze will find it more economical to sell the slag than to retreat it. The author estimates that 300,000,000 lb. bronze is melted annually in the foundries of the United States and that possibly 4,000,000 or 5,000,000 lb. metal is lost through failure to retreat the slag.

Zinc and Its Corrosion Resistance. American Zinc Institute, Inc., 27 Cedar Street, New York. An 82-page, paper bound book presenting in abstract form the existing data concerning research, tests and equipment used in connection with the subject stated in the title. The book is obtainable from the secretary of the Institute for $1 postpaid.

The Constitution of the Copper-Aluminum System, by G. F. Comstock, Metallurgical Engineer, Niagara Falls, N. Y.

The Constitution of Lead-Antimony Alloys, by R. S. Dean, Metallurgist, Western Electric Company of Chicago.

Both of these papers are Non-Ferrous Data Sheets, prepared for that Committee of the Institute of Metals Division and the Recommended Practice Committee of the American Society for Steel Treating.

Papers presented before the meeting of the Faraday Society, 13 South Square, Gray's Inn, London, W. C. I., January 25, 1928:

Overpotential at Metallic Cathodes. Silver in Neutral and Alkaline Solutions, by Julius Grant, M.Sc., A.I.C.

Some Physico-Chemical Properties of Stannous Oxide, by Colin G. Fink and C. L. Mantell. Journal of Physical Chemistry, Volume XXXII, pp. 103-112, January, 1928.

Forging Machine Die Design for Deep Piercing, by E. R. Frost, president, the National Machinery Company, Tiffin, Ohio.

A Metallographic Study of the Path of Fatigue Failure in Copper, by Herbert F. Moore and Frank C. Howard. Bulletin No. 176. Engineering Experiment Station, University of Illinois, Urbana, Ill.

Quantitative Spectrum Analysis, by F. Twyman and D. M. Smith. Institute of Metals Division, A.I.M.E., New York.

Maxima on Current-Voltage Curves. Electrolysis of Nickel Salt Solutions with the Mercury Dropping Cathode, by N. V. Emelianova and J. Heyrovsky.

Maxima on the Current Voltage Curves. Part 2. The Maxima on the Polarization Curves of Uranyl Salt Solutions, by P. Herasymenko.

Electroreduction of Uranyl Salts by Means of the Mercury Dropping Cathode, by P. Herasymenko.

The Lead-Tin System of Alloys Re-Examined by An Electrical Resistance Method, by F. H. Jeffery.

Government Publications

Publications listed hereunder are obtainable from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C., at the prices given, unless otherwise noted.

Elimination of Waste. Simplified Practice Recommendation, Bureau of Standards, Department of Commerce, Washington, D. C., No. 68, on Metal and Fiber Flash-light Cases. Price, 5 cents.

Lead in 1926. (Smelter Report) By Amy Stoll, bureau of Mines, Department of Commerce. This pamphlet covers pages 355-370 of Mineral Resources of the United States, 1926, Part I. Price 5 cents.

Lead in 1926. By Amy Stoll, Bureau of Mines, Washington, D. C. Smelter report; comprises pages 355 to 370 of Mineral Resources of the United States, 1926. Price, 5 cents.

Secondary Metals in 1926. By J. P. Dunlop, Bureau of Mines, Washington, D. C., pages 275 to 295 of Mineral Resources of the United States, 1926. Price, 5 cents.

The Training of Foreman Conference Leaders. Bulletin No. 125, Federal Board for Vocational Education, Washington, D. C. Suggestions as to methods to be followed and types of subject matter recommended by a committee of experienced conference leaders. Price, 20 cents.

Record Book of Business Statistics—Part 2: Metals and Machinery. Department of Commerce, Washington, D. C., Facts from earlier years for comparison with data published monthly in the Survey of Current Business. Price, 10 cents.

Alphabetical Index and Numerical List of United States Government Master Specifications promulgated by the Federal Specifications Board. A circular of the Bureau of Standards, complete to January 1, 1928.

Elimination of Waste. Simplified Practice Recommendation, Bureau of Standards, Department of Commerce, Washington, D. C., No. 63, on Metal Spools for Annealing, Handling and Shipping Wire. Price, 5 cents.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. PETTIS, Rolling Mill; W. J. REARDON, Foundry; P. W. BLAIR, Mechanical; CHARLES H. PROCTOR, Plating Chemical

Cleaning Aluminum

Q.—You could be of service to us in giving us information as to how to clean aluminum sheets.

We use an aluminum sheet .008 in thickness in the manufacture of a high capacity eliminator condenser. Before processing this aluminum we desire that the surface be absolutely clean, free from oil and other foreign matter. We would appreciate your outlining the simplest possible procedure for cleaning.

A.—If you are interested only in a clean aluminum surface and not in a chemically clean surface, all that is necessary is to wash the aluminum in trichlorethylene or in carbon tetrachloride or in a mixture of equal parts of both materials; after that, wipe dry or dry out in fine maple wood sawdust. The cleaners named are grease solvents and are non-explosive. Sponges could be used to remove the surface greases from the aluminum.

If a chemically clean surface is desired as well as a dead lustre on the aluminum as a final finish, the procedure is as follows: Fabricate the articles; wire them up on soft copper wire; place beneath section a glass bead or similar washer to keep the articles separated. Next, prepare the following solution:

Water	1 gallon
Caustic potash	4 ozs.
Soda ash, 58%	2 ozs.

This should be heated in an iron tank to a temperature of 200 deg. F., with either steam coils made of iron and placed inside the tank, or by an exterior heater, such as gas.

Next, immerse the aluminum parts in this solution for 30 seconds, moving them to and fro; then remove them and wash thoroughly in cold water.

The day before commencing these operations, the following acid solution should have been prepared:

Nitric acid, 38°	2 parts by measure
Sulphuric acid, 66°	1 part by measure

Mix the acids slowly, using vitrified stoneware as a container. The acid mixture is used and kept cold.

After cleansing the aluminum parts as outlined above, immerse them in this acid mixture for a moment. The aluminum will have a very dead, white luster. Wash it thoroughly in cold and boiling waters, dry out in maple wood sawdust, or else as a final operation, immerse in the dry cleaners such as indicated for merely cleaning the aluminum surface—trichlorethylene, carbon tetrachloride or gasolene—for a moment, drain well, then dry out in sawdust.—C. H. P. Problem 3,747.

French Gray Finish

Q.—Please tell me a cheap solution for oxidizing on brass directly to make either a French gray or darker shades.

A.—For oxidizing brass, etc., to get a French gray the following solution should give excellent results:

Water	1 gallon
Sodium hyposulphite	8 ozs.
Lead acetate	4 ozs.
Soda ash	½ oz.

Heat the solution to 180° F., then immerse the articles in the solution until satisfactory oxidation has taken place. Next remove the articles and dry out; relieve and lacquer.

Some operators immerse the articles in a liver of sulphur or polysulphite solution after oxidizing as outlined herein. That is done as a toner, and the gray finish becomes darker. Such a solution is as follows:

Water	1 gallon
Polysulphide	⅛ to ⅓ oz.

Immerse the articles previously treated in the lead acetate solution; then in the toning solution for a moment, then remove and wash first in cold and then in boiling waters.—C. H. P. Problem 3,748.

Hot Nickel Solution

Q.—I wish to have information as to the preparation, operation and maintenance of a hot nickel solution for work on stove plate. I wonder if you can tell me anything about this or if there is a good book or article on the subject? I need to know the temperature at which the solution must be worked and all other details for regular commercial production.

A.—There is no difference between maintenance of hot and cold nickel solutions. Hot nickel solutions operated at 120° to 140° F. must contain about twice as much of the active ingredients as the cold solutions. The heating of the solution and the higher metal content permits the use of two to three times as much amperage per square foot of work surface area as is used with cold solutions. The result, finally, is that plating can be done about three times as fast with a hot solution as with a cold solution.

Nickel deposits one hour in a cold solution can be plated in twenty minutes or less in a hot nickel solution. The hot solution should be based on the following formula:

Water	1 gallon
Single nickel salts	24 to 32 ozs.
Nickel chloride	1½ to 2 ozs.
Sal ammoniac	1½ to 2 ozs.
Boracic acid	1½ to 2 ozs.
Epsom salts	8 to 12 ozs.

Water should be added to the solution several times a day to maintain an even water line. Also, about ⅛ oz. of muriatic acid per gallon should be added to the solution every second day. Replenish the solution on the basis of the following:

Single nickel salts	1 lb.
Nickel chloride	4 ozs.
Boracic acid	1 oz.

Use as many pounds of this mixture as may be necessary to keep the hot solution in working order. Always dissolve the materials in boiling water before adding to the solution.—C. H. P. Problem 3,749.

Maintaining Silver Solutions

Q.—I am operating a silver plating solution in which I plate daily about 50 stampings that are about 6 x 10 in. in area. I am not very well versed in the upkeep of the solution and would like to have you advise me as to the necessary additions of cyanide, silver cyanide, etc. I use the best quality silver anodes, and wish to get a heavy white deposit.

A.—In connection with your silver plating operations you should install a volt and ampere meter on your tank leads. This would enable you to standardize your solution control and to measure the amount of silver deposited in a given time. If you determine the amperage and the time required to plate a given number of pieces which approximate a definite surface area, you will have created a standard that will be of great use to you.

Presuming your silver plating solution were prepared upon a standard proportion basis and that your amperage could be determined, then any variation to less than normal amperage would indicate that the solution needed additions to increase the anode corrosion and, consequently, the cathode deposition. (The cathodes are the articles being plated).

The first factor to add to a silver plating solution or any cyanide solution when the amperage falls below normal at a definitely determined voltage is sodium cyanide. If plenty of silver anode surface is being used, additions of sodium cyanide

at regular intervals—say twice a week—will maintain the silver constant in the solution. Water should be added to the solution daily to maintain the normal solution line. The addition of sodium cyanide need not be more than ⅛ to ¼ oz. per gallon of solution at any one time. If addition of sodium cyanide fails to mantain a constant amperage and deposit, then silver cyanide dissolved in an equal amount of sodium cyanide should be added to the bath. Proportions per gallon are: sodium cyanide, ½ oz., and silver cyanide ½ oz. Use a little hot water at 160° F. for solution; always add sodium cyanide at the close of the day's work, stirring the solution thoroughly. If this procedure is followed, excellent results should be obtained.—C. H. P. Problem 3,750.

Polish for Bicycle Parts

Q.—About a year ago there was a formula given in answer to a shop problem requesting a metal polish for dirty bicycle parts. I had that formula but have lost it and would like to have it again. The formula contained carbon tetrachloride, benzine and whiting.

A.—We do not recall the formula of which you speak and without the number of the problem containing it, or the date of the issue, we cannot repeat it. However, the following might be the mixture you wish:

Carbon tetrachloride	3½ gallons
Benzine or naphtha spirits	4 gallons
Aqua ammonia, 20°	2 lbs.
Air floated whiting	19 lbs.

The third ingredient above might have been a mixture of equal parts of air floated whiting silica and whiting to equal a total of 19 or 20 pounds. Either is good. You can reduce the total proportions as you may desire to reduce the volume.—C. H. P. Problem 3,751.

Removing Oil from Plated Surface

Q.—As manufacturers of a small article which is finished with black nickel, we are having some trouble in getting it properly cleaned to take a plated finish. This article is made of two ½ in. soft steel rods about 6 in. long, which are shipped to us in long lengths covered with a thin copper plate and which pivot in a small zinc base die casting placed at each end. These pieces are assembled before cleaning and it is necessary that the pivot joint be lubricated during the assembly. This oil is what causes our trouble in cleaning, as otherwise the parts are clean. It is a light parafine base oil.

Our present method of handling this is to clean and copper strike the article at the same time (using a hot caustic, copper cyanide, solution) then to plate in a copper cyanide solution, and then in the black nickel solution. We find that with the caustic strong enough to properly remove the oil, it pits or oxidizes the die casting.

Any information as to a method or solution that will work on a partly copper plated steel and partly zinc base die casting will be appreciated.

A.—The solution would be to dissolve the oil before immersing the articles in the regular alkaline cleaner as you now do. Parafine oil is a problem; it is difficult to saponify it with an ordinary alkaline cleaner because the oil contains a certain percentage of parafine wax which is insoluble. We suggest that you wash the articles first in either benzene or naphtha spirits; these agents will saponify the grease; dry in maple wood sawdust to remove the benzene or naphtha, or else the articles can be immersed in the alkaline cleaner after the benzene or naphtha treatment. These factors are beneficial in a cleaner. After preliminary cleaning as outlined, it should require only a momentary immersion in a mild alkaline cleaner and not a strong caustic cleaner. The mild cleaner should approximate the following per gallon of water:

Soda ash, 58%	2 ozs.
Tri-sodium phosphate	2 ozs.
Caustic potash	½ oz.
Sodium cyanide, 96-98%	½ oz.

If you follow the directions as outlined here you should not have any further trouble.—C. H. P. Problem 3,752.

Resilvering Britannia Metal

Q.—Will you please outline a method of replating with silver old brittania metal goods? I operate a plating shop in London, England.

A.—The following method is commonly used in the United States for such work:

The old silver is removed by using the old silverplated articles as the anodes in a cyanide solution which is prepared according to the following formula:

Water	1 gallon
Sodium cyanide	12 ozs.
Caustic soda	½ oz.

Operate at 6 volts; use sheet metal cathodes which should entirely surround the stripping tank or container.

Next, dry out after silver is completely removed, and sand bob to remove scratches, etc. You are no doubt familiar with this procedure. After sand bobbing, cleanse in a cleaner composed of the following:

Water	1 gallon
Caustic potash	8 ozs.
Sodium cyanide	1 oz.

Remove any adhering dirt or grease with a swab or soft bristle brush, then wash thoroughly in water. Next, scour the articles with a cloth buff or bristle brush, using the finest flour pumice stone for the purpose; rewash in water; then silver strike in this solution:

Water	1 gallon
Sodium cyanide	12 ozs.
Silver cyanide or chloride	⅓ oz.
Caustic potash	½ oz.

Use 5 to 6 volts; hard sheet steel anodes with very small pieces of silver attached.

Next, silver plate direct under the usual methods. The regular silver solution should approximate the proportions of the following formula:

Water	1 gallon
Sodium or potassium cyanide	8 ozs.
Silver cyanide or chloride	4 ozs.
Caustic potash	½ oz.
Bisulphide of carbon	2 grains*

* There are 438 grains to the ounce; do not exceed quantity stated.

To prepare this solution, dissolve the cyanide and silver cyanide or chloride in one-third of the water, at 180° F. In four ounces of hot water at 140° F, dissolve the caustic potash; then add the bisulphide of carbon and thoroughly mix with the cyanide and silver solution. Finally, add the balance of the water cold to make up the full gallon. Multiply this in proportion for any amount needed.

In order to avoid an excess of free cyanide in the beginning, it is advisable to use only six ounces of sodium or potassium cyanide in preparing the silver solution, and then to add the other two ounces at intervals as may be found necessary to keep the anodes clean and to bring about satisfactory deposition.—C. H. P. Problem 3,753.

Rust-Proof Black Finish for Iron

Q.—I am interested in the New Rust-Proof Black finish for Iron and Steel which was described in an issue of THE METAL INDUSTRY last year. Can you tell me if this is the same as the process called "Parkerizing"? What is the method of using this process?

A.—The article you refer to appeared in THE METAL INDUSTRY for April, 1927, page 154, where the process was fully described. This new process is now being used by makers of automobile rims in place of the zinc plated finish previously used. The rust-proof black finish gives greater resistance to rust for iron and steel articles than any other method yet developed. Reference to the article mentioned above will give a complete description of the process.

This method is not the same as "Parkerizing."—C. H. P. Problem 3,754.

Patents

A REVIEW OF CURRENT PATENTS OF INTEREST

1,656,502. **January 17, 1928. Process of Improving Aluminum Alloys.** Wilhelm Sander, Essen-Ruhr, Germany, assignor to Th. Goldschmidt A.-G., Essen, Germany.

The process of improving aluminum alloys containing crystallizable constituents capable of forming solid solutions with aluminum which comprises quenching such an alloy from a high and glowing temperature, ageing at room temperature and heat treating at a somewhat higher temperature, the ageing being substantially complete prior to the heat treatment.

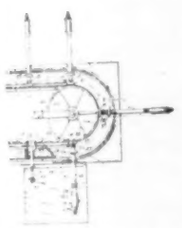
1,656,695. **January 17, 1928. Metal Alloy.** George Clifton Deeter, York, Pa.

A scavenging alloy consisting of 40 to 50 per cent nickel, 3 to 10 per cent tin, 30/100 to 1 per cent phosphorus, 1 and 50/100 per cent to 5 per cent manganese and the balance copper to complete 100 per cent.

1,656,696. **January 17, 1928. Metal Alloy.** George Clifton Deeter, York, Pa.

A scavenging alloy consisting of the following metals taken in the proportions covering the following range: nickel, from 5 to 10 per cent; tin, from 3 to 10 per cent; manganese, from 75/100 to 5 per cent; phosphorus, from 25/1000 to 3 per cent; and copper from 72 to 92 per cent.

1,656,977. **January 24, 1928. Tinning and Retinning Machine.** Frank T. Henry, Detroit, Mich.



In a coating machine, a non-revoluble, pivoted, travelling carrier for the article to be coated and including a horizontal and a vertical arm, said horizontal arm pivoted at its inner end, said vertical arm including means for revolubly supporting the article, operating means for said revoluble supporting means carried by said arms, means for shifting the carrier on its pivot to position the article in a perpendicular manner to permit of the surplus coating dripping from the article.

1,657,147. **January 24, 1928. Varnish and Paint Removing Compound.** Florence H. Brainard, Lone Rock, Wis.

A compound for removing paint, varnish or similar coatings, consisting of a mixture of water, noncaustic alkali and sodium silicate to which has been added an alkali metal citrate as a stabilizer.

1,657,323. **January 24, 1928. Paint and Varnish Remover.** Leo Simon, New York, N. Y., assignor to Sidney Stern, Brooklyn, N. Y.

As a paint and varnish remover an emulsion free from water and containing balata or chicle in solution, mixed with wool grease and volatile organic solvents.

1,657,389. **January 24, 1928. Alloy.** Alfred George Cooper Gwyer and Henry Wilfred Lewis Phillips, London, England, assignors to The British Aluminum Company, Limited, London, England.

A method for physically varying the structure of aluminium-silicon alloys which consists in the addition to the molten alloy of an alkaline earth metal.

1,657,430. **January 24, 1928. Colloidal Copper Sulphide and Process of Preparing the Same.** Augustus E. Craver, New York, N. Y., assignor to The Grasselli Chemical Company, Cleveland, Ohio.

Process of preparing colloidal copper sulphide comprising treating an aqueous solution of a copper salt with a water soluble sulphide in the presence of a protective colloid.

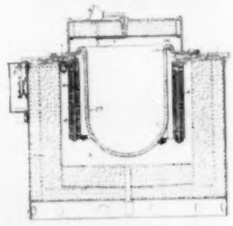
1,658,186. **February 7, 1928. Copper Alloy and Process of Producing and Treating the Same.** Michael G. Corson, Jackson Heights, N. Y., assignor to Electro Metallurgical Company, a Corporation of West Virginia.

A process which comprises subjecting a material consisting predominantly of copper and containing silicon and a metal having the herein described hardening effect of chromium, cobalt and nickel to an homogenizing treatment at high temperature, thereby bringing substantial quantities of silicon and hardening metal into solid solution; quenching, and then heating the material at a temperature between about 250° C. and about 600° C. for a sufficient period to develop a substantial proportion of the hardness attainable at such temperature, and finally cooling the material.

1,657,475. **January 31, 1928. Apparatus for Casting Under Pressure in Dentistry.** Kakujiro Inami, Kashiwagi, Japan.

In casting apparatus for dental prosthesis, a moulding flask comprising a collar portion, a rim portion larger than said collar portion, a latticed portion intermediate and joined to said collar and rim portions, and means adapted to fit over said collar portion for positioning a mould in said flask.

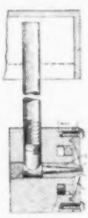
1,657,508. **January 31, 1928. Lead-Pot Support.** Alvin D. Keene, Mansfield, Ohio, assignor to Westinghouse Electric & Manufacturing Company.



A support for a high temperature container in a casing, comprising a plurality of co-axial annular members of different diameters, the inner periphery of one adapted to engage, in supporting relation, the outer periphery of a second, and means for removably maintaining said members in interfitting relation.

1,659,214. **February 14, 1928. Metal-Treating Compound and Method of Making Same.** Milton L. Moyer, Souderton, Pa., assignor, by direct and mesne assignments, to Milton L. Moyer, Edwin J. Prindle, and Bradley Stoughton, Joint Trustees.

A metal treating compound including a fatty substance, a bichloride, and a sulphur containing substance.



1,659,291. **February 14, 1928. Process for Disintegrating Metal.** Everett J. Hall, Passaic, N. J., assignor to Metals Disintegrating Company, Inc., New York.

The process of disintegrating metal or the like material which comprises striking a stream of molten metal or like materials simultaneously and equally on all sides thereof and on convergent angles with a rotating annular flow of disintegrating gas.

1,659,550. **February 14, 1928. Method of and Furnace for Uniting Metal Parts by Fusion.** Christian Steenstrup, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York.

The method of uniting articles by fusion of metal by a continuous process which comprises arranging the articles and the necessary fusion metal in a stack within a furnace, removing fused articles from one end of the stack and adding unfinished articles to the other end thereof, maintaing endwise pressure on the stack to cause firm seating of the parts of the articles to be fused, and maintaining a non-oxidizing atmosphere within the furnace.

1,657,693. **January 31, 1928. Protecting Molten Magnesium.** Harold H. Osborne, Niagara Falls, N. Y., assignor to American Magnesium Corporation, Niagara Falls, N. Y.

The method of protecting molten magnesium and magnesium alloys comprising brining in contact with the molten metal, products resulting from the heatng of glycerine above the melting point of said metal.

1,657,957. **January 31, 1928. Corrosion-Resistant Alloys.** Michael G. Corson, Jackson Heights, N. Y., assignor to Electro Metallurgical Company, a Corporation of West Virginia.

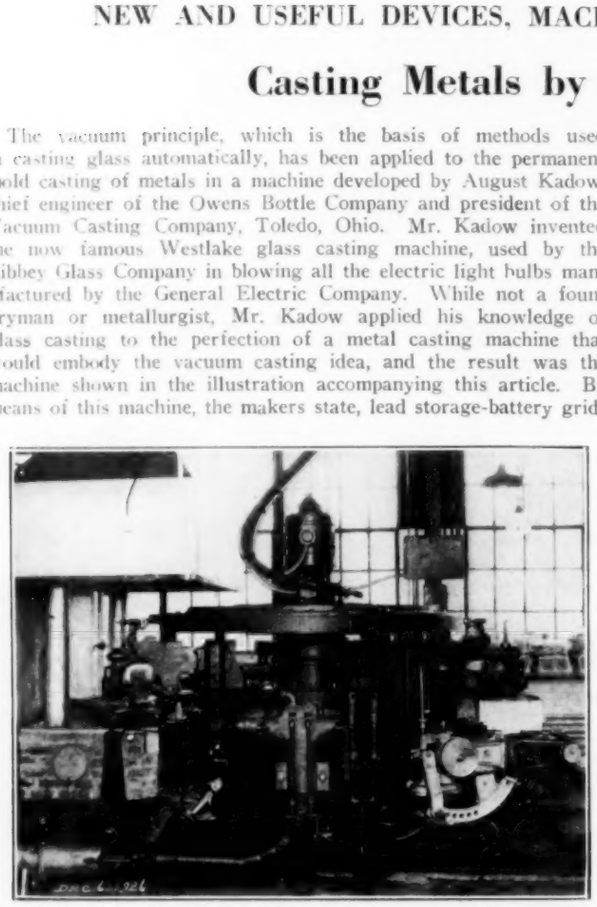
An article of manufacture adapted to resist corrosion by inorganic acids, composed of an alloy containing 35% to 55% manganese with the balance principally copper.

Equipment

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

Casting Metals by the Vacuum System

The vacuum principle, which is the basis of methods used in casting glass automatically, has been applied to the permanent mold casting of metals in a machine developed by August Kadow, chief engineer of the Owens Bottle Company and president of the Vacuum Casting Company, Toledo, Ohio. Mr. Kadow invented the now famous Westlake glass casting machine, used by the Libbey Glass Company in blowing all the electric light bulbs manufactured by the General Electric Company. While not a foundryman or metallurgist, Mr. Kadow applied his knowledge of glass casting to the perfection of a metal casting machine that would embody the vacuum casting idea, and the result was the machine shown in the illustration accompanying this article. By means of this machine, the makers state, lead storage-battery grids



VACUUM CASTING MACHINE

can be cast in quantity, and, because the machine is designed so that the metal is rapidly and properly introduced into the molds, the castings are said to come out totally without blowholes or other imperfections frequently found in castings.

The difficulties in developing this machine should not be minimized by understatement. Mr. Kadow's first experiments were performed on molten lead, with a 16-foot length of pipe. By the use of a vacuum, he was able to fill this pipe with molten lead vertically. By controlling the vacuum the metal could be caused to rise in the tube to any height, partly full, full, or even overfull. The next factor was to restrain the backflow, which seriously hampered the production of a sound casting in the pipe. This was solved after considerable experimentation by making a constricted opening at the end of the pipe and dipping it into the metal bath; this made it possible for the metal to solidify without backflow. There were other problems, such as mold temperature, correct metal temperature, etc., but the two outlined were most difficult to solve. The machine was then constructed to perform automatically the vacuum casting process. The operations of the machine may be stated as follows: The vacuum line is opened, the "gate" end of the vacuum line is dipped in the molten metal which flows into the mold, time is left for solidification, the mold is opened and the casting ejected, the mold is cooled and its joints are smoked to make a seal for the vacuum, loose bits of soot and other foreign matter are brushed out, and the mold is closed and clamped for a new cycle of these operations. The illustration here shows the second of the vacuum casting machines perfected. It weighs 10½ to 11 tons and is 10 ft. 3 in. in diameter. A 3 hp. motor rotates the pillar carrying arms. This motor is mounted on top, as shown in the picture. The motions of the various parts of the machine such as dipping the mold in the metal bath, opening the vacuum line, etc., are controlled by combination roller and cam actions.

The molds, together with the heavy parts supporting them, are revolved around the cylindrical body of the machine on rollers which run between guides. The guides have dips at certain points, and the rollers, following the dips, lower and raise the revolving parts. In the illustration, at the left there is a small, brick oven. This holds a pot of molten metal. When the machine dips the mold, it is immersed in the pot, which is precisely the point at which the operation was photographed. At the opposite side of the machine the oblong, white patch is the end of a curved water bath, in which the molds are immersed for cooling.

A roller, operated by cam, works a device that controls the vacuum apparatus on the mold. Just before the mold is immersed in the molten metal, this device sets the vacuum at any amount for which it has been adjusted, and then the mold drops and the casting operation completed. The machine then continues, carrying the mold around to the ejection point. Ejection is performed by separation of the two halves of the mold by means of eccentrics and then having a projection inside the mold push the casting out. The separation of the mold is effected by dropping one of its sides to a horizontal position by means of the arm which holds it from behind. When in position for casting, the mold halves are vertical and opposite to each other, but closed, rather than open as shown at the right in the illustration, just above the white oblong that represents the end of the cooling bath. Here the two sides of the mold are facing one another but they are apart. In this position they pass through the cooling bath, into which they are lowered in a fashion similar to the lowering necessary for dipping the mold into the molten metal. The water in the cooling bath is thermostatically controlled for temperature, and the bath may be lowered or raised to immerse the mold at varying depths.

After the mold passes through the bath, a small projection on the side of the mold opens the valve to a smoking burner. This burner uses gas which is incompletely consumed, and produces a heavy, yellow flame containing many unconsumed carbon particles which are deposited on the mold faces that pass on either side of the burner. Excess soot or carbon is removed by a vertically revolving brush. After brushing, the eccentric arm action closes the mold and a roller and lever action operates a toggle device which clamps the two halves of the mold together. The clamping device has the appearance of a large open-end wrench. The jaws have a slight taper and when the mold is closed, the device is forced vertically down over two roller pins, one on each half of the mold. The taper of the jaws forces the two parts of the mold tightly together. Then the mold is ready to be dipped into the molten metal and to begin another cycle.

The machine can produce 3,000 battery grids in an hour if a single mold is used. With a double mold twice as many, or 6,000 castings, can be produced in the same length of time. This, of course, refers to a machine having twelve arms in operation.

At present time the Vacuum Casting Company, which manufactures the machines, is designing a smaller machine which will only have two arms, instead of twelve as in the larger. It is expected that the smaller machine will be applicable to plants where smaller production will fill the needs. The firm also is developing a machine which combines the vacuum process and a pressure to densen the casting. This machine fills the mold by the vacuum principle and then a pressure of 200 tons is applied. At present white metal bushings are being produced by this process and the fractured surface of one of the bushings examined showed a tough, solid, finely grained structure.

Although the present developments have been primarily with white metals, castings have been produced from other alloys such as aluminum. Later the firm expects to carry on investigations with other non-ferrous metals and alloys and gray iron, to determine the controlling and limiting factors.

Tabor Squeezing Machines

A survey of the performance of Tabor squeezing machines manufactured by the Tabor Manufacturing Company, Philadelphia, Pa., has been prepared by the A. C. Nielsen Company, engineers. An excerpt of the study follows:

The Gamon Meter Company, one of the largest meter makers in the country, has a battery of six 10-inch Tabor squeezers and four pairs of jarring pattern draw machines in operation in its plant in Newark, N. J., on molds for parts of water type and other meters. The Tabor machines have been in use since the original opening of the foundry in 1912 and have been giving good service since that time with only nominal repairs.

Standard metal snap flasks are used with metal plate patterns. Although different sizes and kinds of molds are made, the standard size of flask has been adopted as 13" x 19" with 4" cope and 3" drag. The operations in making the mold are:

1. Dust pattern.
2. Riddle sand in drag.
3. Shovel sand to fill drag and strike off excess sand with edge of board.
4. Place bottom board over flask.
5. Turn over flask and fill cope with sand.
6. Draw yoke of machine forward to vertical position and squeeze both cope and drag at same time.
7. Vibrate and pull off cope while vibrating.
8. Draw match plate, using vibrator.
9. Replace cope.
10. Unsnap flask and place finished mold on floor, ready for pouring.

The metal used is an alloy of copper, tin, zinc and lead in the ratio of 85-5-5-5. It is melted in and poured directly from crucibles of 200 to 280 pounds capacity which are brought from the furnaces by an overhead crane. Pyro-meter check is used on the temperature of the metal and one man does all the pouring.

Two typical pieces have been considered to show the class of work turned out by the squeezer. The first and more difficult piece, because of the long draw required, is a register box ring. Six of these pieces are cast per mold. The second piece is a meter cover cap.

Production varies considerably from day to day depending upon the personal element, but the average production with the 10-inch Tabor squeezer is about 60 molds in 8 hours of operation. This piece has never been made by hand molding, but it is estimated that 40 molds per day with hand work would be all that could possibly be turned out. This would be cut down considerably if much patching was required.

The following figures show the costs of operation, including depreciation based on a fifteen-year life:

The daily operating cost, including the daily fixed charge of $.21, air cost of $.18, and an average operating labor cost of $8.55, amounts to a total of $8.94.

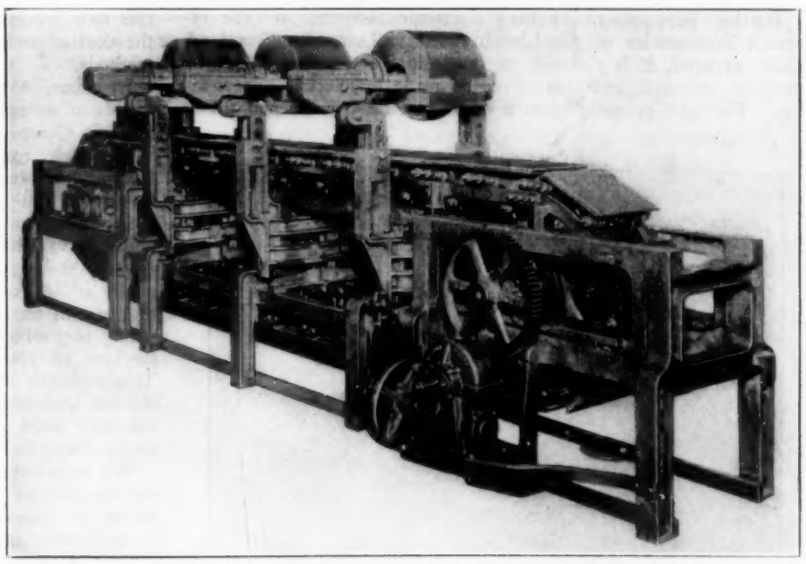
With an average daily production of 140 register cover cap molds, the unit molding cost is $.064. For the register box rings, with a daily production of 60, the unit cost is $.149.

Based on the estimated output of the above pieces with hand molding, the unit molding cost on the register cover cap would be $.143 as compared to the present cost of $.064. The unit saving is thus $.079—a cost reduction of 55%—and the daily saving is $11.06 per machine.

With the register box rings the unit cost with hand molding would be $.214 as compared to $.149 with the machine. The unit saving is $.065 per mold (a 30% reduction) and the daily saving is $3.90 per machine.

Straight-Line Polishing Machine

A new development in automatic polishing is the Larson Straight-line Machine which has been designed primarily for polishing large flat surface articles, such as: Bumper bars, moulding strips, T squares, et cetera. The machine is being placed on the market by the Hanson-Van Winkle-Munning Company, Matawan, N. J. In addition to ordinary straight flat polishing, the design of this machine is said to lend itself to innumerable special polishing and buffing operations through the use of lifting cams for irregular shapes, positive rotating fixtures for circular work (such as automobile lamps) and automatic spinning fixtures for bolt heads or vanity cases. It is claimed that almost any hand operation can be duplicated, due to the flexibility of the spindle adjustment and the rigidity of the work platens. The outstanding features of the straight-line machine is the carrier table which consists of a series of cast iron platens that interlock to form a solid table on which the work is set. These work platens are machined true and are mounted on adjustable hardened rollers. This adjustment insures perfect alignment of top surface of platens with each other, and forms an adequate base on which to fasten mechanical fixtures or magnetic chucks for holding the work in place. The rollers in turn are run on a track which is both true and rigid, maintaining the platen tops at a constant level, and insuring the solid support so necessary for fine polishing.



LARSON STRAIGHT LINE POLISHING MACHINE

The spindles are adjustable to any pressure and oscillate over the work. The combination of balanced spring pressure and continuous to and fro movement of spindles provides the "human give," constantly moving the wheel over the face of the work just as is done by the skilled polisher. If desired, the oscillating motion may be eliminated on the last spindle to straighten the high-light marks. For all cutting operations, the polishing wheels spin opposite to the direction the work is taking; for final finish, the last wheel may be rotated in the opposite direction so that the work goes in the same direction or, "with the wheel to fan" the work. In this way a high finish may be obtained. The spindle yokes and wheels may be set at various angles so that each succeeding wheel will polish or buff out the marks left by the preceding wheel. Any number of polishing wheels can be used as the machine is built on a sectional basis.

The movement of the table is controlled by foot levers placed at both the delivery and receiving ends. The table may be quickly brought to a dead stop by pressure of the foot clutch. When the table is started the spindle heads automatically lower the polishing wheels to the work. When the table is stopped the wheels are automatically lifted. When in operation, the work platens carry the parts to be processed under the polishing wheels which are set at predetermined heights. Each wheel takes but a slight cut. By using three or more wheels the total amount of material removed at one handling is multiplied.

Chromium Plating Controller

Chromium plating can be carried out at two different temperature ranges. In the cold process the temperature is maintained at 50 deg. F. to a maximum of not over 65 deg. F. by either jacketing the plating tank and using cold water as the

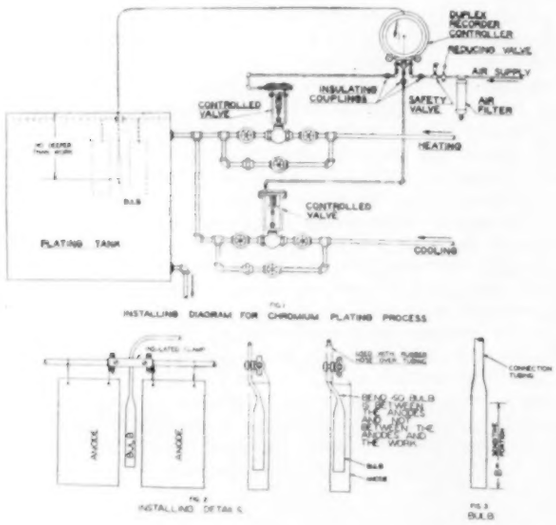


DIAGRAM OF RECORDER INSTALLATION IN CHROMIUM PLATING PLANT

cooling medium or by passing cold brine from refrigeration machines through a coil in the bottom of the tank, says the Foxboro Company, Inc., Foxboro, Mass., in describing a recorder-controller for chromium plating operations which it has just placed on the market.

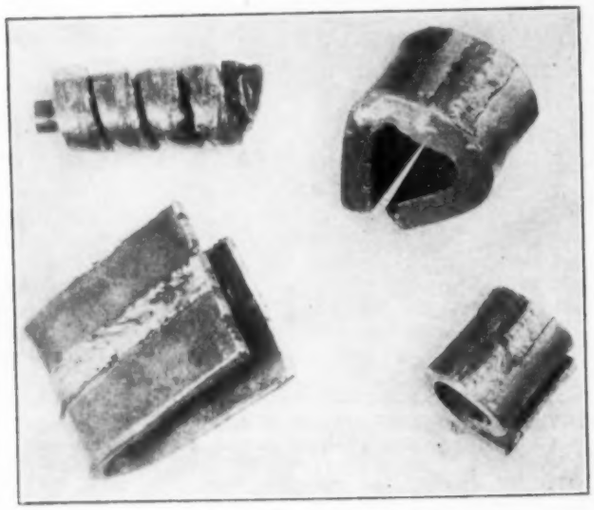
In the process as ordinarily carried out the temperature range is approximately 105 to 120 deg. F., and may run up to 130 deg. F. occasionally, but in order to yield a hard bright finish the plating must be carried out at a very definite temperature, which is generally between 110 and 115 deg. F. The temperature must be maintained with very narrow limits or the type of chromium deposit changes physically and the efficiency of the plating operation drops off rapidly. The operator's problem is further complicated by the fact that the resistance of the solution to the passage of current results in a heating of the solution which must be counteracted by the use of a cooling medium. For this reason the tanks are usually equipped with a lead coil, located either on the bottom or at the side of the tank. This coil is connected to both hot and cold water lines or steam and cold water lines for maintaining the proper temperature. Some of the older types of tanks were provided with an outside jacket supplied with coils which are connected to both the hot and the cold water lines.

A Foxboro Duplex temperature recorder-controller provides the operator with a means of controlling the temperature of the chromium plating bath within closer limits than he can do it manually, and which will do it without supervision, it is stated. The single controller operates two valves, one to bring the temperature up to the set point and the other to prevent the temperature from going above the set point.

The controller is said to be an accurate, positive, automatic machine using air as a motive power. It is not a "hotter-colder" device but a definite temperature control. The action of the controller is so sensitive and positive that the resulting temperature record of the plating bath is practically a straight line, the company claims. Although its adaptation to plating is relatively recent, the instrument itself is not a new experimental device and is sold fully guaranteed.

Electronic Tornado Process of Welding

Further development of the "electronic tornado," by the research laboratories of the Lincoln Electric Company, Cleveland, Ohio, promise, it is claimed, to revolutionize all ideas as to the ductility, strength and cost of welds made by electric arc welding. This new process, based upon an electric phenomenon which



WELDS MADE BY "ELECTRONIC TORNADO" PROCESS

was originally considered of scientific interest only, has been further developed, and its commercial application is said to be assured. It is claimed that not only are the welds produced by this new process far more uniform in structure and ductility, but the cost of welding is but a fraction of the cost by present day methods.

In regard to the use of this welding method for non-ferrous metals, a statement by A. F. Davis, vice-president of the Lincoln Electric Company, says:

"The 'electronic tornado' is applied to carbon arc automatic welding machines. The electric arc is normally difficult to control. It creates its own magnetic field and the passage of the welding current through the parts being welded creates magnetic fields of variable direction. The arc, therefore, tends to wander around seeking the path of least resistance between its own magnetic field and the field produced by the passage of the welding current through the piece being welded. By superimposing a strong magnetic field on the arc flame, the new control permits the arc to travel through variable fields without disturbance. This magnetic control appears to give the arc a gyratory motion and the controlled arc has been called an 'electronic tornado,' the magnetic field apparently giving a swirling or gyratory motion to the electrons in the arc.

"We have not so far attempted to do very much with this process on non-ferrous metals, but have done some work in manufacturing on copper and tanks and pipes and believe that it can be used very satisfactorily on some other non-ferrous work. It is impossible for us to give a complete description of the machine at this time because it has not been commercially placed on the market."

Sheet Pewter

The Hoyt Metal Company of St. Louis, Mo., is manufacturing a sheet pewter composed of 92% tin and the balance copper and antimony, for use in making pewter ware.

This material gives a finished product of very high lustre which can be easily worked.

Equipment and Supply Catalogs

Buffs, Polishing Wheels and Compositions. E. Reed Burns and Sons, Inc., Brooklyn, N. Y.

Belt Dressing Facts. E. F. Houghton and Company, Philadelphia, Pa. Outlines the proper care of belts.

Compressors and Vacuum Pumps. Ingersoll-Rand Company, New York City. Describes Class ER and FR machines.

C-E Air Preheater. Combustion Engineering Corporation, New York. Describes changes in design made since last catalog was published.

100 and 1 Ways to Save Money. Ingersoll-Rand Company, New York City. Describes uses of Ingersoll-Rand portable compressors, as well as tools operated with them, etc.

Science Applied to Metal Cleaning. The Cowles Detergent Company, Cleveland, O. Scientific methods of cleaning, especially in regard to colloidal chemistry as applied to cleaners.

Brushes. Hanson-Van Winkle-Munning Company, Matawan, N. J. This is bulletin No. 10, illustrating and describing the company's complete line of industrial brushes for cleaning and finishing of metal, glass, rubber and other surfaces.

General Electric Catalog Sheets. General Electric Company, Schenectady, N. Y. Individual pamphlets on: D-c. Magnetic Controllers; Automatic Throw-over Panels; Adjustable-speed Direct-current Motors; Direct Current Motors, Type BD; Centrifugal Air Compressors, Single Stage; Arc Suppression Plates for Drum Controllers; Enclosed Starting Rheostats.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

American Electroplaters' Society

HEADQUARTERS, CARE OF W. S. BARROWS, 628 DOVERCOURT ROAD, TORONTO, CANADA

CONVENTION INFORMATION

Platers employed in the United States who wish to exhibit samples of finishes in the annual contest for the prize award, will have no difficulty entering Canada with incomplete specimens. Make an honest, straightforward declaration and if duty is demanded, John Walker, chairman of the Exhibits Committee, will arrange to have the goods entered under bond. Samples which are obviously of no commercial value will simplify matters.

Due to brevity of time at our disposal for shop visits we have not included this form of entertainment in our program. However, any of our guests who desire to visit one or more of Toronto's plating plants will be courteously directed by W. W. ("Billy") Wells, Jr.

All the trains, boats, buses and airplanes arriving in Toronto, Sunday, afternoon and evening, June 24, and Monday morning, June 25, will be met by one or more of the Reception Committee, of which Joseph Ellis is chairman.

The following is a list of Toronto hotels which will be glad to accommodate all who come for the convention. Early reservations are urged as the city is a crowded place in the summer time. All these are in the city proper, at the street addresses indicated:

Alexandra Palace, 184 University Avenue
Carls-Rite Hotel, Front and Simcoe Streets
Casa Loma, Wells Hill
Elliott Hotel, Church and Shuter Sts.
Florence Hotel, 30 King St., W.
Iroquois Hotel, 141-147 King St. W.
Isabella Hotel, Sherbourne and Isabella Sts.
King Edward Hotel, 27 King St. East
Marlborough Hotel, 214 Jarvis St.
Prince George Hotel, King and York Sts.
Royal Cecil Hotel, Jarvis and Dundas Sts.
Stoodleigh Hotel, 74 Shuter St.
Tudor Hotel, 559 Sherbourne St.
Tusco Hotel, Jarvis and Dundas Sts.
Tuxedo Hotel, 504 Sherbourne St.
Victoria Hotel, 58 Yonge St.
Walker House, Front and York Sts.
Waverley Hotel, Spadina Ave. and College St.
Westminster Hotel, 240 Jarvis St.
Westmoreland Hotel, 254 Jarvis St.
Windermere Hotel, 232 Jarvis St.

When you approach the hotel register, do so with an air of confidence; sign your name and tell the clerk you are going to attend the Electroplaters' Convention.

Tom O'Keefe, chairman of the Entertainment Committee, wants every baseball fan in the Society to be on the job Tuesday, June 26, when the game is called at Victoria Park, Niagara Falls, Ontario. Tom says players will be picked from the members only.

Play your arrival in Toronto for Sunday, June 24. Register early Monday morning and secure your seat for the opening session which begins at 10.00 A. M.

All manufacturers of electroplated goods are requested to send their foremen platers to this big annual gathering. Foremen platers are urged to invite their bosses. The knowledge to be obtained here will be up to date. Some of the latest developments in mechanical plating equipment will be shown in the exhibition hall just across the corridor from the convention room at the King Edward Hotel, 27 King Street, West, Toronto.

Hartford Branch

HEADQUARTERS, CARE OF TENANT ELWIN, 76 CARPENTER AVENUE, MERIDEN, CONN.

ANNUAL MEETING AND BANQUET

The annual meeting and banquet of the Hartford Connecticut Valley Branch of the American Electroplaters Society will be held on Saturday, May 12, 1928, at the Hotel Bond, Hartford.

There will be an afternoon educational session starting at 3:00 o'clock, at which George B. Hogaboom will preside. Particulars were published in our April issue and a report of the meeting will appear in the June issue as the present goes to press too late for its inclusion.

American Electrochemical Society

HEADQUARTERS, COLUMBIA UNIVERSITY, NEW YORK CITY

NEW YORK SECTION—SPRING MEETING

There will be an informal dinner at 6:30 p. m., on May 18, at the Chemists' Club, 52 East 41st Street, New York, after which there will be a round-table discussion of "The Corrosion of Lead Cable Sheath Underground," at which Dr. R. M. Burns, of Bell Telephone Laboratories, will be the principal speaker.

International Fellowship Club

HEADQUARTERS, CARE OF W. SCHNEIDER, 119 TIMES SQUARE STATION, NEW YORK

The International Fellowship Club will hold a luncheon at 1 p. m. June 26th at the King Edward Hotel, Toronto, Canada, during the annual convention of the American Electroplaters' Society. All those who wish to attend, kindly notify the Secretary, W. Schneider, 119 Times Square Station, N. Y., immediately.

American Zinc Institute

HEADQUARTERS, 27 CEDAR STREET, NEW YORK CITY

OFFICERS ELECTED

The following new officers were elected at the annual meeting of the American Zinc Institute, held at St. Louis, Mo., April 16:

President, R. M. Roosevelt, vice president, Eagle-Picher Lead Company; vice-presidents, Jesse G. Starr, president, Quenton Smelter Company; Percy B. Butler, manager, Barnsdall Zinc Company; John A. McCarthy, Anaconda Copper Mining Company; secretary, Stephen S. Tuthill; treasurer, Howard I. Young, vice-president, American Zinc, Lead and

Smelting Company; new director, **Edgar L. Newhouse**, chairman of board, American Smelting and Refining Company, to succeed Alex J. McCay, resigned.

National Metal Trades Association

HEADQUARTERS, 1021 PEOPLES GAS BUILDING, CHICAGO, ILL.

The thirtieth annual convention of the National Metal Trades Association was held at the Hotel Astor, New York, on April 25 and 26.

Harold C. Smith, President of the Illinois Tool Works, was elected to the presidency of the Association. The other officers elected were: First vice-president, J. G. Benedict, Landis Machine Company, Waynesboro, Pa.; second vice-president, Jacob D. Cox, Jr., Cleveland Twist Drill Company, Cleveland, Ohio; treasurer, J. W. O'Leary, Arthur J. O'Leary & Son Company, Chicago, Ill.; councilors for two years, J. H. Van Alstyne, Otis Elevator Company, New York, N. Y.; H. C. Beaver, Rolls-Royce of America, Inc., Springfield, Mass.; J. C. Spence, The Norton Company, Worcester, Mass.; R. J. Russell, Century Electric Company, St. Louis, Mo.; Theodore Trecker, Kearny & Trecker Corporation, Milwaukee, Wis.; Paul T. Norton, Case Crane and Kilbourne Jacobs Company, Columbus, Ohio.

The convention reflected the unusual history and experience of the Association. For thirty years this Association has successfully operated in the field of labor. It limits its activities to the maintenance of equitable conditions in the workshops of its member plants.

The Convention program was exceptionally strong in the subjects treated and the outstanding men who made the addresses. Among these was Magnus W. Alexander, President of the National Industrial Conference Board, who discussed the unemployment situation from the standpoint of the machinization of industry. Howard Coonley, President of the Walworth Company, Boston, Mass., analyzed and discussed the subject of industrial budgeting as it applies to metal-working plants.

GEORGE SEYLER
Works Manager, Lunkenheimer Company.

Walter Gordon Merritt of the League for Industrial Rights, made an address on the tendencies to change laws pertaining to the Anti-Trust Act and unduly to restrict the Judiciary.

Unique features of the program were found in the work of George Seyler and Gordon L. Hostetter. Mr. Seyler, who is the works manager of the Lunkenheimer Company of Cincinnati, Ohio, converted the Thursday morning assembly into an informal demonstration of the modified conference plan.

The Annual Banquet held on Wednesday evening, the 25th, was one of the largest in the Association's history.

Personals

David Levinger

David Levinger, announcement of whose promotion to the post of Engineer of Manufacture of the Western Electric Company was made a short time ago, has been associated with that company for the past eighteen years. In his new post, he is responsible for what has been called the most highly developed manufacturing engineering organization in the world—the development organization of the company located at its two great plants in Chicago, Ill., and Kearny, N. J.

DAVID LEVINGER

Mr. Levinger was born in Delta, Idaho, forty-one years ago and was educated in the public schools of Chicago. At the age of twenty he became a steel inspector with the International Harvester Company, at the same time attending public night schools and, later, the Chicago Technical College, specializing in mechanical engineering.

In 1910, after three years with International Harvester, Mr. Levinger joined the staff of the Western Electric at its Hawthorne Works in Chicago, as a mechanical engineer. Here his engineering and executive ability was quickly recognized and he progressed through various supervisory positions to his present position. As Engineer of Manufacture, he heads a force of nearly a thousand technically trained men, guiding them in the work of developing manufacturing methods and equipment. The work of this organization has proved remarkably successful in reducing manufacturing costs and in bettering the quality of the factory product.

Among the notable engineering projects supervised by Mr. Levinger is the copper rod and wire mill at the Hawthorne Works of the company in Chicago. This mill is considered a distinct advance over previous mills, necessitating only a fourth of the floor space required for a given output as well as conserving man power. In other lines of manufacture he has developed automatic and semi-automatic equipment for machining, assembling and testing the product, labor saving handling equipment, and a number of improved machines and methods that have had important results in industries outside the field of telephone manufacture.

In addition to his activities within the Western Electric organization Mr. Levinger is active in the work of the American Institute of Mining and Metallurgical Engineers, of which he is a director and member of the research committee. He is a member of the A. S. M. E., Western Society of Engineers and the Steel Treaters Society.

H. D. Savage, for many years vice-president of the Combustion Engineering Corporation, New York, has been elected president, to succeed Joseph P. Santry, who has resigned.

George T. Ladd has been elected vice-chairman of the board of directors of the Combustion Engineering Corporation, New York.

Wylie Brown, vice-president of the American Copper Products Company, and president of British American Metals and Tube Company, of Plainfield, N. J., has been elected president of Habirshaw Cable and Wire Corporation.

R. S. Archer, research metallurgist, Aluminum Company of America, of Cleveland, Ohio, recently gave a discussion of aluminum before the Hartford, Conn., and Worcester, Mass., chapters of the American Society for Steel Treating, on March 13 and 14 respectively.

J. Frautschi has been appointed purchasing agent of The Bunting Brass and Bronze Company, Toledo, Ohio, succeeding **T. H. Niver.** This company operates smelting and refining, bronze foundry, brass machine shop and grinding divisions.

Dr. Colin G. Fink, head of the division of electrochemistry, Columbia University, addressed the Maryland Section of the American Chemical Society on "The Theory of Corrosion and the Restoration of Antique Bronzes" at Baltimore, Md., on March 30.

Eugene A. Weaver, formerly of the home office of the Surface Combustion Company, is being transferred as district manager of the Boston office to fill the vacancy caused by the resignation of L. B. Crossman, who has accepted a position with the Boston Consolidated Gas Company, in charge of industrial and certain commercial activities.

Charles Starr Barbour has just joined the staff of the International Chemical Company, Philadelphia, Pa. Mr. Barbour had his early training with the Barbour Silver Company in Meriden, Conn. Later he did considerable consulting work on electro-plating and kindred problems, particularly with the Bureau of Standards and the Bureau of Printing and Engraving in Washington, D. C. For the past few years, Mr. Barbour has been the chief technical service man for the A. P. Munning Company. He will devote his efforts particularly to the New England territory.

William Westerman has resigned as works manager of the Michigan Copper and Brass Company, Detroit, and has accepted a position with the Rome Brass and Copper Company, Rome N. Y., as consulting engineer. Mr. Westerman was foreman of the slitting department of the Coe Brass Company, Torrington, Conn., from 1883 to 1896, and superintendent of the Coe Brass and American Brass branch at Ansonia, Conn., from 1896 to 1915; manager of the brass mills of the Western Cartridge Company, East Alton, Ill., from 1915 to 1918; works manager of the Michigan Copper and Brass Company from 1918 to 1928.

Charles L. Allen, president and general manager of the Norton Company, Worcester, Mass., manufacturers of abrasives, celebrated his seventieth birthday on March 6. In honor of this occasion, the employes of the Norton Company presented him with a bronze statuette, "The Scout," modeled by C. E. Dallin. Mr. Allen has been general manager of the company for the past 43 years, and president for 10 years. He has been active in the concern's affairs since it was incorporated in 1885 as the Norton Emery Wheel Company, with one plant. The company now has plants in the United States, Canada, France and Germany, and has a range of products that is known throughout the world. These include abrasives, refractories, grinding machinery, floor materials, cements, and many other items.

Obituaries

Harmon W. Hendricks

Harmon W. Hendricks, president of Hendricks Brothers, 49 Cliff Street, New York, died at his home 270 Park Avenue, New York Saturday, March 31. His death came suddenly as he had been at his office the day before without any indications of ill health. He was eighty-three years of age.

Mr. Hendricks had been engaged in the metal business for over fifty years. Hendricks Brothers has been in existence for one hundred sixty-four years, having been formed in 1764. At the present time they operate the Belleville Copper Rolling Mills, Belleville, N. J., which has been running continuously since 1813. They also conduct a large jobbing business in metals including copper, lead, zinc, tin, antimony and solders. The Belleville mill has what is said to be one of the largest rolls for copper in the country; it is 156 inches long and 30 inches in diameter.

Mr. Hendricks was the last of four brothers associated with his firm.

Frank H. Hoffman

Frank H. Hoffman, manager of the Detroit Copper and Brass Rolling Mills, the Detroit branch of the American Brass Company, died Sunday in that city following a brief illness.

Mr. Hoffman was born November 11, 1861, in Allentown, Pa. He was one of the deans of the brass industry, having been engaged in it practically all of his business life. He was with Merchant and Company of Philadelphia for about five years, leaving them in 1888 to go with Randolph and Clowes of Waterbury as assistant manager. He left Randolph and Clowes to go back with Merchant and Company (later Merchant and Evans), but stayed there for only a short period. He went with the Detroit Copper and Brass Rolling Mills of Detroit, Mich., in 1898 and remained there until his death.

He was a member of a number of clubs and prominent in many Detroit activities.

Mr. Hoffman leaves a grown son, Luther Hoffman.

William R. Quinn

William Robert Quinn, well-known designer of fuel oil burning equipment, died suddenly of heart disease in his room at the Hotel Manger, New York, on April 12.

Mr. Quinn was a resident of San Francisco for several years, having gone there as the Pacific coast representative of Combustion Engineering Corporation. He was in New York on a business trip at the time of his death.

Mr. Quinn was president of the Quinn Oil Burner and Torch Company until this company was purchased by Combustion Engineering Corporation in 1922. He then became manager of the fuel oil burning equipment department of the latter organization, which position he held until he went to San Francisco as Pacific Coast representative for the corporation.

Henry K. Benson

Henry K. Benson, for many years the president of the Benson Rolling Mills, Glen Ridge, New Jersey, which has latterly been acquired and operated by the Baltimore Brass Company, died of apoplexy on April 21. Mr. Benson was 85 years of age and was considered a pioneer in the brass and silver rolling industry in New Jersey. At the time of his death he was no longer connected with the brass mills at Glen Ridge but he was a director of the Bloomfield National Bank and the Glen Ridge Trust Company. Mr. Benson is survived by a daughter and a sister.

Charles W. Leavitt

Charles W. Leavitt, at one time head of C. W. Leavitt and Company, 30 Church Street, New York, importers and sales agents for metals, alloys and ores, died on April 22 at his home, Meadow Farm, Hartsdale, N. Y.

Mr. Leavitt was 57 years of age, and had retired from the Leavitt concern in 1904. He had aided his father, C. W. Leavitt, in founding the firm.

Homer Walters

Homer Walters, for more than twenty-five years in charge of electroplating at the works of The Frost Manufacturing Company, Kenosha, Wis., died in March. According to W. J. Frost, president of the company, Mr. Homer's death was a very considerable loss to the company, which held him to be one of the finest electroplaters in the country.

B. W. Eckfeldt

B. W. Eckfeldt, Pennsylvania district manager for the Hanson-Van Winkle-Munning Company, Matawan, N. J., manufacturers of chemicals, machinery and supplies for platers and polishers, died suddenly from heart failure while driving his car in Philadelphia last month. Mr. Eckfeldt is survived by his widow and a son.

Harry W. Ward

Harry W. Ward, president of the Pittsburgh Brass Manufacturing Company, Pittsburgh, Pa., died at his home at La Jolla, Calif., on February 3. Mr. Ward was fifty-five years of age and had been ill for several years. He had gone to California in an effort to regain his health.

News of the Industry

Industrial and Financial Events

Simplified Practice for Abrasives

A simplified practice recommendation for coated abrasive products was adopted at a general conference held April 11, 1928, at the Department of Commerce, Washington, D. C., under auspices of the Division of Simplified Practice. This recommendation provides that certain sizes and varieties of abrasive paper and cloth will be manufactured as stock items after September 1, 1928, which will, according to estimates given at the conference, care for at least 95 per cent of the trade. The conference set the first revision date for the recommendation for July 1, 1929, and allowed until January 2, 1929, to clear the present manufactured stock.

The Division of Simplified Practice will shortly circularize the manufacturers, distributors and users of the commodity for written acceptances.

Madison-Kipp Buys Lubrication Line

The Madison-Kipp Corporation, Madison, Wis., has purchased from the Detroit Lubricator Company, Detroit, Mich., its entire force-feed lubricator division, with the exception of the locomotive-type lubricator section. The purchase gives the Madison-Kipp Corporation all equipment, patents, designs and inventory used in production of Detroit models "G," "JT," and "JTS" lubricators. The Detroit company will continue to manufacture its hydrostatic and locomotive force-feed types of lubricators. All the physical assets purchased are to be removed to Madison, Wis.

Paasche Company Wins Suit

The Paasche Airbrush Company, Chicago, Illinois, has won its patent suit on pressure feed airpainting units as defendant in the case of Alliance Security Company against Roman Paint Company, in the U. S. District Court. Decision was rendered on April 10 by Federal Court Judge Saint Sure at San Francisco, California, who decided that the construction of Paasche pressure-feed painting units represented no infringement.

Babbitt Metal Consumption Large

The total apparent consumption of Babbitt metal in March, based on reports received by the U. S. Department of Commerce from 31 firms, was 4,927,634 pounds as compared with 4,470,368 in February and 5,626,400 in March, 1927. This consumption is calculated from sales by manufacturers and consumption by those firms (among them several important railroad systems) which consume their own production.

Anaconda Copper Mining Company

Anaconda Copper Mining Company and subsidiary companies for the year ended Dec. 31, 1927, show net income of $10,121,141 after depreciation, depletion, interest and appropriating $2,117 to minority interest, compared with $14,266,203 in the preceding year. The decrease in income is attributed to curtailed operations and the low prices received for its products.

Michigan Smelting and Refining Company

The Michigan Smelting and Refining Company passed its quarterly common dividend which was due in April. On January 3, 1928, the company paid 25 cents a share.

International Silver Company

The International Silver Company and its subsidiaries report for the first quarter of 1928 a net income of $236,018, as compared with $364,392 in the same 1927 quarter.

Buy Interest in Nichols Copper Company

The Phelps Dodge Corporation, Calumet and Arizona Mining Company, New Cornelia Copper Company and the Nichols Copper Company have formed an agreement whereby these concerns, the first three of which are copper ore producers, will all have an interest in the Nichols company in order to provide facilities for refining their own copper production. The Nichols company owns an electrolytic refinery at Laurel Hill, Long Island, N. Y. A second refinery is to be erected in the Southwest, where some of the ore will be refined. The balance will be sent to the Long Island plant. A joint selling agency is to be formed by the companies involved. This will be known as the Phelps Dodge Selling Agency and each concern will be interested to an extent proportionate with its copper sales. The new refinery will be completed within two years.

Sterling Bronze Has New Plant

Sterling Bronze Company, Inc., which was purchased in November, 1927, by The Frink Company, Inc., New York, and merged into The Frink Corporation, has acquired the 5-story building in Long Island City, New York, known as the Standard 8 Building, which it expects to occupy about June 1, 1928, together with the Frink concern. Both companies are manufacturers of lighting fixtures and the new plant is expected to be one of the finest in the world for lighting fixture and lighting specialty production. The Sterling Bronze Company, Inc., will continue to maintain its showroom at 18 East Fortieth Street, New York, and The Frink Corporation will continue to maintain its offices at 120 Broadway, New York.

Ohio Body and Blower Company

The entire machinery and equipment of the Ohio Body and Blower Company, Cleveland, Ohio, will be sold at Public auction on Wednesday, May 23, 1928, by the Industrial Plants Corporation, auctioneers, who have been instructed to sell without limit or reserve in piecemeal lots. The sale is not subject to court confirmation, hence this sale marks the end of the business career of the Ohio Body and Blower Company.

The plant, which is one of the newest and most up-to-date of its kind in the automotive field, contains more than 300,000 square feet laid out in the most efficient manner, using the approved conveyor systems throughout, with a capacity of 100 closed car bodies per day. Plant production during operation averaged $500,000 monthly.

To Further Industrial Expansion

The Department of Manufacture of the United States Chamber of Commerce has inaugurated a new service which is designated "Industrial Expansion in the Making." This service will render aid to various Chambers of Commerce throughout the country when the latter find themselves in need of information as to the establishment of new plants and other commercial enterprises in the communities in which they are located. Industrial surveys, statistical data and other material will be gathered for the work.

Progress of British Metal Industry

The third Census of Production in Great Britain, which was taken in 1924 and of which the Board of Trade is now issuing a sectional analysis, is of more than usual importance, as it is the first and only census taken since the war. In fact, it is just 20 years since the last census was taken. One was commenced in 1912, but, owing to the amount of work involved, it had not reached the analyzing stage at the outbreak of war, when all further work on it had to be abandoned.

The latest section of the analysis deals with the non-ferrous metals group, and includes the smelting, rolling, and casting of copper and brass, the refining of gold, silver and platinum, and the smelting, rolling and casting of all other non-ferrous metals. The total value of goods made and work done in the first group amounted in 1924 to £21,351,000 ($106,755,000), of which £342,000 ($1,710,000) was for work done. Brass and alloys of copper accounted for £11,061,000 and copper for £7,927,000, the remainder being made up of aluminum, scrap, etc. The net output in 1924 was valued at £5,467,000. The total power capacity was 32,395 horse-power, as compared with a total capacity of 43,806 horse-power in 1907.

The section dealing with the refining of gold, silver and platinum is not yet published, but for the smelting, rolling and casting of other non-ferrous metals, excepting copper and brass, the value of the total output was £31,222,000, of which £188,000 was for work done. The net output was £5,943,000.

Incorporations

Standard Alloy Company, 1679 Collamer Road, Cleveland, O., has been incorporated with $25,000 capital, to manufacture chrome-nickel castings of various compositions for heat and acid resisting purposes. Incorporators: John M. Williams, F. F. Jackson, Emerson Williams.

Superior Oxy-Acetylene Company, Kingshighway and Connecticut Street, St. Louis, Mo., has been organized and will start production about June 1 of oxygen and acetylene job welding and cutting equipment. A plant has been built and all equipment has been purchased.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Conn.

May 1, 1928.

The **Waterbury Clock Company** and the **Ingersoll Watch Company**, its subsidiary, have been prohibited from maintaining resale prices on Ingersoll watches by an order of the Federal Trade Commission. The order is directed against sending out notices in which it is stated that any dealer who sells at less than the established price will be liable for damages and making any threats of bringing any such suits. President **Irving H. Chase** of the company said that the order will not seriously bother them. A slight change in the wording of the statements the company sends out with the watches will satisfy the commission, he thinks. He denied that the company attempts to fix prices. It simply suggests prices to the trade. However, he said, the Commission felt that certain words in the company's statement implied threats. There was only one point in the statement to which the Commission objected, he said, and a slight change will eliminate the objection.

Seymour Smith and Sons, Inc., has started a $75,000 addition to its plant. It will be three stories in height and of brick.

The American Brass Company plans to fill in the old Manhan Canal and develop this property, possibly by erecting a factory building there. The canal is a relic of bygone days when the old factory stood where the West plant of the **American Brass Company** is now, and was operated by water-power from the Naugatuck River from which the water was diverted and brought through the canal.

The Scovill Manufacturing Company is asking the city to pay one bill of $534 and another of $950 for cleaning out its canal near Baldwin Street. Under an old agreement the city was allowed to empty storm water into the canal provided the city would stand the cost of cleaning it if sand and dirt in the storm water clogged it up. The company claims the bills represent the cost of cleaning out the canal on two different occasions.

E. O. Goss, president of the **Scoville Manufacturing Company**, has been reelected a director of the New Haven Railroad.

The **Donle-Bristol Corporation** of Meriden is in process of dissolution. **William H. Bristol**, of this city, president of the **Bristol Company**, and the **Donlie Electrical Products Corporation** of Meriden are the only stockholders. The company was formed to handle a certain process in the manufacture of goods made by both concerns which can now be eliminated.

William H. Bristol, president of the **Bristol Company**, was the principal speaker at the meeting of the Waterbury section of the American Society of Mechanical Engineers held in the Bristol studio adjoining the Bristol Company's plant last month. He also demonstrated the new "Bristophone," the latest product of his factory.—W. R. B.

Bridgeport, Conn.

May 1, 1928.

The **Wright Manufacturing Company** of Lisbon, Ohio, maker of chain hoists, trolleys and cranes, has sold its business and trade name to the American Chain Company here.

The Bullard Machine Tool Company has brought an action against the city of Bridgeport and the town of Fairfield to compel them to repair or reconstruct the Brewster Street bridge over Ash Creek. The bridge is used to a large extent by the concern in transporting goods and materials between its two plants.

The Bilton Machine Tool Company is to be sold at auction to satisfy claims of creditors. The creditors have already made a bid of $500,000 which it is expected will be accepted as it will probably be the only one offered, the creditors having an inside knowledge of the plant and the plans to start new operations. In the meantime, Clarence E. Bilton, founder of the company, intends to form a new corporation having no connection with the old concern to manufacture the special machinery on which the early success of the former company was based. Space will be leased from one of the present industrial concerns in the city.

W. Homer Pease, traffic manager of the Bridgeport Brass Company, presided at the meeting in Hartford last month of manufacturers from all over the state who plan to fight the increased rail and water rates to the southwest. It was voted to raise money to prosecute the case.

The Bassick Company has taken over the large factory unit of the **Columbia Graphophone Company** at Railroad and Howard Avenues, built in 1915. It is six stories high and has a floor space of 132,400 square feet. A railroad siding is being built and on its completion machinery, materials and stock will be shipped from Meriden and Newark. The company says that it will concentrate its manufacturing in this city and that eventually 1,500 employes will be added to its present staff. Automobile and furniture hardware will be the principal articles manufactured.

Christopher C. Donahue, president and treasurer of the **Union Specialty Company**, died at his home here on April 18, after a brief illness.

The Hemco Electric Company, which came here from Long Island about two years ago through the auspices of the Chamber of Commerce, has been taken over by the **Bryant Electric Company**. The arrangement to absorb the Hemco Company by the purchase of its trade marks, patents and processes by the Bryant concern has been under consideration for some months.—W. R. B.

Connecticut Notes

May 1, 1928.

HARTFORD—**The Veeder Manufacturing Company** has been purchased by Paine, Webber and Company, New York

investment brokers, for a price said to be in excess of $2,000,000. The business was started in 1895 with a capital of $7,000. Its business was originally to manufacture a cyclometer for bicycles but has grown to include all kinds of measuring and counting machines. During the war it grew enormously through the manufacture of a device for showing aviators how much ammunition they had left.

Directors of the recently merged **Arrow-Hart and Hegeman Company,** one of the largest wire manufacturers in the East, have declared the first dividend since the merger, amounting to 40 cents a share.

Frank E. Wolcott, vice president of the **Beardsley and Wolcott Manufacturing Company** of Hartford and Waterbury, has been elected a director of the **Riverside Trust Company.**

The Standard Screw Company reports a net income for 1927 of $577,758 after all deductions, including the cost of construction of the new plant at Chicago. The sum of $52,210 was added to the surplus making that $2,756,530. The new Chicago plant is now in operation.

Billings and Spencer Mfg. Company common and preferred stock to the amount of 75 percent of the total outstanding has been deposited with protective committees. Plans for financial rehabilitation will be prepared shortly which may mean assessment against the stockholders. During 1927 the company showed a profit.

James N. Carney, industrial engineer at the **Colt Firearms Company, and J. Carleton Ward,** vice president and general manager of the **Hartford Machine Screw Company**, were the principal speakers at last month's meeting of the Hartford chapter, National Cost Accountants.

NEW BRITAIN—Two new industries are coming here. The **J. C. McAdams Company** of Long Island will open a branch plant here for the manufacture of automobile radiators, taking over floor space in the building once occupied by part of the **Traut & Hine Company.**

F. J. Wachter, formerly vice president of **Landers, Frary and Clark,** has completed arrangements for the establishment of a concern to manufacture sporting goods. It will also use part of the building formerly occupied by the Traut & Hine Co.

Elbridge M. Wightman, vice president and secretary of the **North and Judd Mfg. Company,** has refused an offer to become a director of the National Associated Investors, Inc.

Officials of the **Fafnir Bearing Company** have announced that additions to their present buildings are planned and will be erected soon, due to increased business. One of the first additions will be a hardening room. The **Fafnir Bearing Company** has received a release on April orders for bearings placed with it by the **Ford Motor Company.** The April orders show an increase of 10 to 15 percent over the March orders from the company but are still smaller than those received for the old model Ford.

TORRINGTON—A large storage shed owned and occupied by the **Fitzgerald Manufacturing Company** was destroyed by fire April 5. About 500 gallons of oil, considerable excelsior, and a number of correspondence files were destroyed, with a total loss of $2,000.

John H. Graham, aged 74, died April 3 at Charlotte Hungerford hospital. He has been in the employ of the local plant of the **American Brass Company** for nearly 40 years, during 20 years of which he has been a foreman.

MERIDEN—Directors of the **International Silver Company** last month reelected all the officers.

The **Lewis A. Miller Company** has started to erect a factory addition 50 by 152 feet, two stories in height.

The **International Silver Co.** had an elaborate silver exhibit at the **Eastern Arts Exhibition** in Hartford, April 18, 19 and 20.

BRISTOL—The directors of the **Root Company** have recommended to the stockholders that the concern be sold to **Paine, Webber and Company,** New York investment brokers, who have purchased the **Veeder Company** of Hartford. The local concern, like Veeder, manufactures counting and adding devices.

NEW HAVEN—**Leonard S. Tyler,** recently ousted as president and general manager of the **Acme Wire Company,** is trying to line up the stockholders to secure his return and the overthrow of the present board of directors. **Victor M. Tyler,** his brother and president of the company, has announced that he stands with him. **Leonard Tyler** has offered to buy one half of the stock of the company at $20 a share, provided the other half is deposited in a voting trust that will guarantee to support his management for five years. He offers as an alternative that the stockholders retain all their holdings but deposit the total in a voting trust to support his management. The company is a $1,300,000 corporation. It is not known where he has secured the financial backing to enable him to make the offer, but it is rumored that a Western Electric group, headed by **Leonard J. Horner,** a director and former official of the local company, is interested in the project.

THOMASTON—Contract has been awarded for the construction of a five story, concrete, brick and steel addition to the **Seth Thomas Clock Company** plant, at a cost of $100,000. It will be 75 by 100 feet and must be completed by July.

TERRYVILLE—The cabinet lock department of the **Eagle Lock Company** resumed a 10-hour a day schedule last month after being on an eight hour schedule for many weeks.

The **Cooper Oven Thermometer Company** is now running on an overtime working schedule.—W. R. B.

Middle Atlantic States

Trenton, N. J.

May 1, 1928.

The plant of the **Mercer Motor Car Company,** which has been idle for the past four years has been purchased by the **Roller Bearing Company of America,** Newark, N. J. The company will move all its equipment from its Newark plant and will set up its industry as quickly as possible in the main factory building, which comprises 55,000 square feet of space. The Mercer company occupies 11½ acres and the buildings have 175,000 square feet of floor space. The Newark concern will lease part of the plant to other industries. The roller bearing firm will employ about 100 men and the force will be increased later. Under an expansion program now being carried out, the company has been forced to quit the Newark factory and move to larger quarters. **Joseph C. Trainer,** wealthy Philadelphian, is president of the Roller eBaring Company. Other members of the firm are David H. Litter, of Newark, and New York; Emanuel Scheck, Alan Jones and John J. Berliss, all of Newark.

Two Trenton concerns will build additions to their plants. **The John A. Roebling's Sons Company** has let a contract for a new physical laboratory on South Broad Street to cost $25,000. The **Crescent Armored Wire Company** has let a contract for an addition on North Olden Avenue to cost $5,000.

Raymond N. Burke has leased a plant on Coates Street and will conduct a brass foundry business here.

Annandale Graphite Company, Annandale, N. J., is installing two carloads of new machinery in the plant. The concern will shortly erect a large steel and concrete plant near High Bridge, N. J.

United Refining Company, Newark, has been incorporated with $10,000 capital to refine gold. **Sure Guard Sales Corporation,** Newark, was chartered with $50,000 preferred and 900 shares common, to manufacture safety devices. The following concerns have also been chartered at Trenton: **Porcelain Enamel Metal Products Corporation,** Washington, N. J., $100,000; **Cholet-Vanderhoef,** New Brunswick, N. J., manufacture chemicals, $50,000; **Frank H. Schafer Company,** Camden, manufacture valves, 2,500 shares no par; **Asbury Graphite Mills,** Asbury Park, manufacturing graphite, $200,000; **H. M. P. Cutlery Company,** Guttenburg, manufacture cutlery, $50,000; **Eastwood Wire Company,** Belleville, manufacture wire, $300,000. **David Kahn, Inc.,** North Bergen, manufacture pens and pencils, $250,000; **Bonatz Brothers, Inc.,** Cliffside Park,

manufacture lighting fixtures, $25,000; **Probak Corporation,** Jersey City, manufacture safety razors, $125,000; **Hispaniola Mining and Development Company,** Woodbridge, mining, 1,000 shares; **Henry L. Crowley & Company,** Inc., East Orange, manufacture spark plugs, 11,000 shares no par.

The **John A. Roebling's Sons Company** recently entertained the members of the foremanship training class at a banquet in the Stacy-Trent Hotel. About 75 were present. Former Governor Edward C. Stokes spoke. He paid a tribute to the late **John A. Roebling,** who designed the world famous wire rope. **Daniel Ross** was toastmaster.—C. A. L.

Newark, N. J.

May 1, 1928.

Newark metal manufacturers announce that there is an upward trend in business and that it has improved over last month.

Roe Art Metal Works, 21-23 Mulberry Street, Newark, has purchased an additional plot of ground, 192 by 50 feet and will build an addition to the factory. The building will be erected at once to take care of increasing business.

Baker and Company, Inc., refiners of platinum, Newark, will erect additions to their plant. The business of the concern is increasing.

The property at 145 and 147 Jackson Street has been sold by the **Connor-Lattin Company,** jewelry manufacturers, Hartford, Conn., to the **Guarantee Finding Company, Inc.,** for the manufacture of jewelry.

A voluntary petition in bankruptcy has been filed in the Federal Court here by **Mu-Rad Laboratories, Inc.,** 800 Fifth Avenue, Asbury Park, N. Y., manufacturers of radio equipment. The assets are listed at $180,777 and liabilities at $123,-044. The company is said to lack cash to meet current obligations. The matter was referred to a referee in bankruptcy.—C. A. L.

Middle Western States

Detroit, Mich.

May 1, 1928.

The first all-aluminum motor coach body ever built in Detroit left the plant of the **Murray Corporation of America** recently, bound for Chicago and Minneapolis. It is the first of a series being built for the **Motor Transit Management Company,** operators of the Greyhound lines, and for the **Northern Transportation Company,** a subsidiary of the **Great Northern Railroad.** The new coaches are being developed to offer long distance journeys in comfort equal to railway travel. The bus shell is built entirely of a heat-treated aluminum alloy called "Murlyte," similar in character to duralumin, the metal which became famous in connection with airship construction.

George E. Edmunds, formerly of **Edmunds and Jones,** Detroit automobile lamp manufacturers, was recently elected president of the **Eastwood Manufacturers Company,** Newark, N. J., manufacturers of valves and wire screen.

The **Bohn Aluminum and Brass Corporation,** Detroit, will erect a one-story factory building at its No. 3 plant in the near future. The general contract has been awarded.

The general contract for the factory building to be erected in Detroit for the **Commonwealth Brass Company** has been awarded to Grant Powers, Detroit.

Commercial Aircraft Corporation has been incorporated in Detroit with capital stock of $50,000. It will manufacture airplanes and aeronautic machinery. The stockholders are **Louis P. LeVitre, Harry W. Anderson** and **Jack Harding,** 648 Helen avenue, Detroit.

The Grand Rapids Enamel Sign Corporation is the name of a new concern incorporated at Grand Rapids, Mich. It has capital stock of $25,000. The stockholders are **George V. Brandt, Francis D. Stokes** and **John C. Bresnahan,** 2002 Plainfield avenue, Grand Rapids.

Campbell Wyant and Cannon Foundry Company, Muskegon Heights, Mich., has returned to full time production with a daily operating force of about 1,700.

Directors of the **Hoskins Manufacturing Company,** Detroit, will inaugurate dividends at the rate of $2.32 per annum commencing June 30, it is announced. This concern is one of the largest manufacturers of nickel-chromium electrical resistance wires, ribbons, strips and rods in the world. **Hiram Walker** is president.

The name of **Battle Creek Farmer Lubrication Devices,** Battle Creek, Mich., has been changed to **Lubrication Devices,** Inc.

The **Detroit Lubricator Company,** it is announced has been purchased by the **Madison-Kipp Corporation,** Madison, Wis. The latter corporation acquires all the equipment, patents, designs, and inventory used by the Detroit company, with the exception of the locomotive type of lubricator which the Detroit **Lubricator** organization will continue to manufacture, it is stated.

Bohn Aluminum and Brass Company, Detroit, has received a contract to supply the new Whippet car with Bohnalite pistons and it is expected to announce other contracts of substantial size within a short time. The company is now operating day and night in the production of aluminum pistons.

John W. Brown Manufacturing Company, producers of auto lamps, reports net earnings of $182,132 for the first three months of 1928.

Steady increases in business have necessitated the construction of two additions to the plant of the **Macklin Company,** Jackson, Mich., manufacturers of abrasive grinding wheels. The addition will triple the present capacity of the plant, says President Thomas J. McIntyre. Contract for the new buildings has been let.—F. J. H.

Toledo, Ohio

May 1, 1928.

Manufacturing plants in this territory, especially those engaged in non-ferrous work, are now operating extensively and prospects look favorable for a considerable time ahead. The same report comes from the plating plants, not only those operating individually, but also those connected with other industries as departments.

Everything points to a good summer in the manufacturing field. The gradual revival of the motor car industry has aided materially in stimulating all lines of business.

Many Toledo plants are engaged on contracts from Detroit automobile companies and have orders that will keep them busy for a considerable time. The employment situation also is favorable. More people are working at the present time than were engaged a year ago.—F. J. H.

Cleveland, Ohio

May 1, 1928.

As in most of the lake cities, Cleveland industries, particularly those in the metal trade are getting well into production. For a considerable time business has continued to show steady improvement, although every one interested would like to see it still better.

Manufacturers of copper, brass, aluminum and other nonferrous metal articles are showing gains practically every week. Motor car companies are still extensive factors in this business.

Plating plants also are fairly well engaged, with favorable prospects for the future. Contracts for raw materials, however, are limited to immediate requirements, with keen competition prevailing.—F. J. H.

Chicago, Ill.

May 1, 1928.

The **Dallas Brass and Copper Company,** C. D. Dallas, president, reports that their new copper rolling mill located in this city is now running with orders booked to full capacity. This new copper mill has been built adjoining their sheet brass mill and is the most competely electrified mill in the country, even the annealing being done by electricity.

The Chicago Association of Commerce says that manu-

facturing production is two per cent larger than a year ago, while production of minerals is slightly declining. The recent survey of unemployment, conducted by the **American Federation of Labor**, reveals Chicago as having the lowest per cent of unemployment. This study covers twenty-three representative cities. Local index numbers of employment in specific industries show metals and machinery five per cent higher in February than January, with wage earnings fourteen per cent greater, and sheet metal workers with eleven per cent increase over January and earnings nineteen per cent higher. The metal industries group now has 129,000 wage earners, an increase of 3,300 over January, with earnings up nine per cent.—W. S. H.

Mechanical Plating Company has bought the one-and two-story building, at 1522 West Austin Avenue from George P. Cullen for a reported $37,000.

Fred C. Kramer Company, was incorporated with a capital of 3,750 shares non par value common and $75,000 preferred. The firm will manufacture and deal in power and heating plants, general metal plumbing equipment and accessories. The incorporators are, F. W. Kramer, Elizabeth and Norma Kramer and Fred C. Kramer. The plant is located at 224 N. Jefferson St.

Massots Brass and Aluminum Corporation, 1044 W. Van Buren Street, was incorporated with a capital of $25,000. The firm will deal in iron, copper, aluminum, nickel, zinc and their alloyed metals. The incorporators listed are: W. F. Massots, J. F. Huske and A. C. Philmann.

Lunway Metal Products Company, 77 West Washington street, was incorporated with 400 shares of no par value by I. B. Lipson, Marie Osterhout, and Randolph Thornton. The firm will manufacture and deal in material, merchandise and machinery.

Weber Diamond Company, 2019 W. Division street, was incorporated with a capital of $65,000. The firm will manufacture and deal in steel, iron, brass and other metals and products thereof. The incorporators are: Samuel Diamond, Anna Diamond and L. A. Roberts.—A. P. N.

Milwaukee, Wis.

May 1, 1928.

April marks the twenty-fifth anniversary of the **Leyse Aluminum Company** of Kewaunee, Wis. Just twenty-five years ago **A. B. Leyse** and **Norman Leyse** began in the aluminum business in a little shop, which is still standing at Two Rivers, Wis. Their business was so small that they only used the first floor. Previous to starting in business, **A. B. Leyse** was foreman in the buffing room of the **Aluminum Manufacturing Company**, now a part of the **Aluminum Goods Manufacturing Company.** In 1905 the entire equipment and machinery of the Leyse plant was moved to Kewaunee. The firm was incorporated for $15,000 and a new factory building was built. The firm grew steadily and in 1916 the capital stock was increased to $75,000. The company continued to manufacture aluminum signs until 1919 when they decided to go into the manufacture of aluminum utensils. The capital stock was then increased to $200,000 and the firm name changed to the **Leyse Aluminum Company.** In 1920 the capital stock was increased to $400,000. The present officers are A. B. Leyse, president; L. Albert Karel, vice-president; and Norman Leyse, secretary and treasurer.—A. P. N.

Other Countries

Birmingham, England

April 16, 1928.

One of the most active departments of Birmingham hardware is that of lamps. After a long interval, home and foreign railways are placing orders for lamps. The factories have enough work to occupy them for months.

The rollers of copper and non-ferrous pipe in Birmingham continue moderately busy, orders generally being replaced as they are executed. The mills could do with more work, but the position compares very favorably with that of a year ago.

The silver and electroplating trades in Birmingham and Sheffield are fairly active and are likely to be so for some months to come. They are about equally occupied on home and foreign business. Very good sales have been made to Australia, South Africa, New Zealand and Canada. The Canadians show a decided preference for Birmingham metal ware. One Birmingham firm has evolved a new form of stainless plate which has been tested in every possible way and will, it is believed, keep its color for at least 30 years.

The manufacturers of builders' hardware have encouraged the use of various forms of brass and bronze ware for door handles, locks, window fittings, etc., and an increasing proportion of fittings are in white metal, or some form of nickel alloy.

The makers of brass taps and similar fittings, chiefly for industrial requirements, are very well occupied, but complaints are rife of a form of foreign competition which has lately become prevalent. The home buyer demands from the British maker either the addition of his name or some distinctive number which serves a similar purpose. The German manufacturers, it is said, are occupying these numbers. It is thought that a remedy may be found in the application of the Merchandise Marks Act, and this is now being considered by the manufacturers.

One of the features of the trade revival is a remarkable increase of exports to the Continent, very largely of non-ferrous products. One shipping agency alone sent last year 18,144 tons, as compared with 7,609 tons in 1925. A large proportion of this was Birmingham non-ferrous hardware.

The demand for galvanized tanks for transport has been greatly stimulated by the expanding shipments. The protection given by this container is very much appreciated and no equal substitute has been found.

The use of aluminum hollow ware is extending and displays of this ware were a conspicuous feature of the British Industries Fair. Keen competition, however is met with from Germany, and the manufacturers bitterly resent the refusal of the Government to apply the Safeguarding of Industries Act in compliance with the application some time ago.

The revival of shipbuilding has brought some orders for non-ferrous fittings of certain kinds and some very large firms in Birmingham are very busy also on cycle and motor fittings which very largely consist of non-ferrous metal.—J. H.

Business Items–Verified

Art Plating Works, Los Angeles, Cal., operated by J. F. Gallon and J. Sambursky, has been removed to a new atelier at 416 East Eighth Street, between Maple and Wall.

Mid-West Die Casting Company, Milwaukee, Wis., which was incorporated a year ago, is now in production. The company makes tools, dies and die castings, operating a tool room and a casting shop.

The Brown Instrument Company has secured larger quarters for its Pacific Coast branch at 420 Westinghouse Electric Building, 420 South San Pedro Street, Los Angeles, Calif. Stanley F. Godfrey is manager.

Jaden Manufacturing Company, Hastings, Neb., hardware manufacturers, have awarded a contract for construction of a 1-story factory, to cost about $75,000. The company operates a plating and lacquering department.

Sully Brass Foundry, Ltd., has purchased the foundry building on the south side of Wabash Avenue, Toronto, Canada, which it will equip and operate as a brass foundry. The company's present address is 2388 Dundas West.

The Ideal Air Brush Manufacturing Company has removed to new and more commodious quarters at 270 Lafayette Street, New York City, as of May 1, 1928. The company's steadily increasing business made this necessary. Telephone number is Canal 5333.

Guarantee Finding Company, Inc., Orchard and Kinney Streets, Newark, N. J., manufacturers of ring findings, has purchased a 1-story factory, 50 x 100 ft., at 145-47 Jackson Street, which it will occupy shortly. The company states it is not in need of supplies.

MacDermid, Inc., Waterbury, Conn., has been appointed Connecticut and Massachusetts distributor of the products of the **Advance Wheel Manufacturing Company, Inc.,** Chicago, Ill., makers of polishing wheels for all industries. Consumers in the territory named are being advised of this appointment.

Doehler Die Casting Company has removed its executive offices from Brooklyn, N. Y., to 386 Fourth Avenue, corner 27th Street, New York City, where it has taken the 19th floor. This has been necessitated by the crowded conditions at the Brooklyn plant, where every available foot of floor space is now required for production.

Wright Manufacturing Company, Lisbon, Ohio, makers of chain hoists, trolleys, cranes, etc., have sold their business and trade name to the **American Chain Company,** Bridgeport, Conn. No change in policy or sales organization is anticipated, and **H. F. Wright** and **W. F. Wright** will continue to manage their respective divisions of sales and production.

W. R. Voorhees and Company, San Francisco, California, and Seattle, Washington, are now representing **The Billings and Spencer Company,** Hartford, Connecticut, in Montana, Colorado, Wyoming, Idaho, Utah, Nevada, Washington, Oregon, California, Arizona, New Mexico and El Paso, Texas. They handle the entire Billings line of wrenches, hammers, pliers, clamps, dogs, etc., and also special forgings and machinery.

Maas and Waldstein Company, manufacturers of lacquers, announce the removal of their executive and sales offices from New York City to 438 Riverside Avenue, Newark, N. J., effective May 1, 1928. The company hopes that removal of the offices to Newark, where its plants are located, will bring closer contact between all departments and make for greater efficiency and increased service to customers. The new telephone number is Branch Brook 4416.

The Lincoln Electric Company, Cleveland, O., announces the following changes and additions: **H. A. Stamper** has been placed in charge of consumer motor sales in the New York district. **D. F. Titus** is now in charge of welder service in the New York district. **A. H. Kirkpatrick** replaces **D. W. Carver** as manager of welder service in the Cincinnati district, Mr. Carver having been transferred to the Cleveland district. **H. E. Nelson** now takes charge of consumer motor sales in the Cincinnati district. **P. A. Ludwig** has assumed charge of welder service in Philadelphia and vicinity. **Forrest Kessler** has been transferred to welder service in the Cleveland district. **J. R. Rothermel** is in charge of welder service at Chicago, while **W. Weaver** has been placed in charge of consumer motor sales there.

Review of the Wrought Metal Business

By J. J. WHITEHEAD,

President, Whitehead Metal Products Company of New York, Inc.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

MAY 1, 1928.

Business in the fabricated brass and copper products proceeded on an even keel during April, with no changes worth noting and no events of a character sufficiently unusual to justify mentioning. The prices since March 29 have remained steady and unchanged. Mills are running on about the same basis as that which has prevailed during the past several months. There is almost an entire absence of complaints among the large factors in the industry, which is in itself a fairly good indication that things are as good as can be normally expected.

It may be of interest to note that during April the largest battery of copper hot water tanks ever made was installed in the New York Life Insurance Company's new building in New York City. There are five of these heaters, each of 1,000 gallon capacity, installed five stories below the street level and made to stand a pressure of 400 lbs. to the square inch. The shells are one-half inch thick, the heads three-quarter inch thick, and each boiler weighs about four tons.

The mills and refineries of the producers of monel metal and pure nickel are running on a basis unprecedented in their history. The order books for nickel are larger than at any time since the war and the sales of monel metal are on a record-breaking basis for all time. There is no indication of any slowing down in these lines.

Metal Market Review

By R. J. HOUSTON,

D. Houston & Company, Metal Brokers, New York

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

COPPER

May 1, 1928.

Copper continues to show a firm undertone in keeping with the tendency noted a month ago. Present quotations are on the basis of 14¼ cents delivered in Connecticut Valley and 14½ cents c.i.f. European ports. Good sized sales have been made for domestic shipment, and there has been a continuous flow of export orders. A few minor and temporary variations were noted during the past month, but these did not justify concessions on the part of leading sellers.

Conditions were favorable to decided improvement in the situation. According to present indications, it is assumed there are further reasons for definite signs of fundamental strength. A new policy holds sway. This means progress towards greater stability and increased confidence. The market action of copper has not been spectacular lately as regards price levels. Selling prices, however, are 1¼ cents per pound higher than a year ago, but the present level of values is still much below the average price for the last 30 years. A further stiffening of market rates depends upon economic considerations and regulation of output. Total sales during April were heavy.

ZINC

The trend towards improvement in the zinc market is slow and laborious. Recent developments have proved slightly more favorable to producing interests with a price basis of 5.80c to 5.82c East St. Louis prevailing at the end of April. This quotation compares with 5.72½c to 5.75c early in the month. A stronger tone in the London market tended to a more cheerful sentiment here. The earning position of the industry, however, is not profitable enough at recent low prices for slab zinc. A more stringent application of curtailment measures would solve some of the problems. Production in March amounted to 55,881 tons as against 5,042 tons in February. The March output was the largest in 12 months. Deliveries, however, for that month were 55,642 tons. Stocks on April 1, 1928, amounted to 41,529 tons and compared with 36,279 tons on April 1, 1927. The ore situation shows sales at $38 per ton, with output for last week in April of 9,700 tons, as against sales of 8,580 tons.

TIN

The tin situation for several weeks has been variable and unsettled. Market prices are notably lower than a year ago, and the

recent drift indicated further downward tendencies. It is recognized that the position of tin has changed radically, and that influences exist which seem to foreshadow a readjustment of market prices to more reasonable levels.

Production of tin in 1927 was estimated at 154,602 tons, against 141,714 tons in 1926. These figures compare with 113,455 tons in 1921 and 128,984 tons in 1923. Output in Federated Malay States and Bolivia showed a marked increase last year. Figures for the first quarter of 1928 show total supplies of 31,063 tons and deliveries of 31,210 tons, which indicates that demand is keeping pace with the increase in production. American deliveries of tin during April were 7,010 tons and for the first four months of 1928 amounted to 26,175 tons as compared with 25,525 tons for the corresponding months in 1927. Market was depressed at close of month and April-May shipment sold at 50¾c for Straits.

LEAD

A good domestic demand for lead has prevailed, but it was not vigorous enough to carry the level of values above 6.10c New York basis. In the Middle West an occasional concession of a small fraction was made. Buyers showed considerable caution, although a moderate amount of business was a daily feature. Inquiries have been coming in for May and June and new interest is looked for in the near future. World production in March was reported at 154,800 tons as against 145,800 tons in February and 149,900 tons in January.

ALUMINUM

Current conditions continue favorable to market firmness for aluminum. A large volume of the metal is going into consumption every month. Activity at automobile plants gives reassurance of support from this important industry. Producers are therefore finding a ready outlet for most of the material produced each month. Stocks of foreign origin in bonded warehouse recently were the smallest in six months, and available supplies are consequently under good control. Prices continue steady at 24.30c for 99% plus ingot and 22.30c for 94% plus.

ANTIMONY

The general tone of the market was firm at the month end, with increased strength for both spot and future positions. Chinese selling limits recently were reported at 8c c.i.f. New York, equal to 10c duty paid, and some business was done on this basis for April-May shipment. Demand from consumers has not been specially urgent. The majority of buyers do not appear interested on a large scale. Holders here and abroad, however, were inclined to maintain a firm attitude. There was a firmer tone later, with more buying interest displayed and May arrival quoted at 10⅛c to 10¼c duty paid.

QUICKSILVER

There has been a fair inquiry for quicksilver, but actual business is in moderate quantities. Prices quoted by importers vary from $123.50 to $125 per flask of 76 pounds.

PLATINUM

Refined platinum quotes $76.50 per ounce. Russia is developing platinum deposits, and the revival of the industry in that country will increase output to a substantial extent.

SILVER

A firmer market has developed for silver in all quarters. The official price at this writing is up to 58½ cents per ounce, and good opinion looks for still higher prices. China and India have been good buyers in this market, and further support from Far East orders is awaited. Silver imports into India showed increase lately, with London sending the bulk of shipments. New York has also furnished important quantities on Indian orders.

OLD METALS

There was a firmer market, and broader operations in scrap copper early in April. Demand was stimulated into briskness at improved prices and heavy copper advanced to 12.80c, with a good export inquiry. There was also considerable buying of this material for domestic consumption. New brass scrap was in request, but old brass and composition was reported as being dull. Copper wire and crucible copper found sale at rising prices recently, and the situation in this grade of metal reflects the firmer position of the new product. Exports of brass and copper scrap continue heavy. Copper scrap is a scarce commodity in Great Britain, and there is a heavy decrease in all warehouse stocks of both old and new copper in England. New York dealers are buyers of heavy copper at 11c to 11½c, light copper, 9½c to 10c, new brass clippings 9c to 9¼c, heavy lead 4¾c to 5c and aluminum clippings 17c to 17½c.

Daily Metal Prices for the Month of April, 1928

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	2	3	4	5	6*	9	10	11	12	13	16	17
Copper c/lb. Duty Free												
Lake (Delivered)	14.30	14.30	14.30	14.30	....	14.30	14.25	14.25	14.25	14.25	14.25	14.25
Electrolytic (f. a. s. N. Y.)	14.35	14.35	14.35	14.35	....	14.35	14.35	14.35	14.35	14.35	14.35	14.35
Casting (f. o. b. Ref.)	13.80	13.90	13.90	13.90	....	13.90	13.90	13.90	13.90	13.90	13.90	13.90
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	5.75	5.75	5.75	5.775	....	5.775	5.75	5.725	5.725	5.725	5.75	5.75
Brass Special	5.80	5.86	5.80	5.825	....	5.825	5.80	5.775	5.775	5.775	5.80	5.80
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	53.875	53.50	53.25	52.75	....	52.50	52	52.125	51.50	51.875	52.375	52.875
Pig 99%	53.25	53.125	52.75	52.375	....	52.125	51.875	51.625	51.125	51.375	51.875	52.375
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.00	6.05	6.05	6.05	....	6.05	6.05	6.00	6.00	6.00	6.00	6.00
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	....	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb												
Ingot	35	35	35	35	....	35	35	35	35	35	35	35
Shot	36	36	36	36	....	36	36	36	36	36	36	36
Electrolytic	37	37	37	37	....	37	37	37	37	37	37	37
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	9.625	9.50	9.50	9.50	....	9.625	9.75	10.00	10.00	10.00	10.00	10.25
Silver c/oz. Troy Duty Free	57	57.125	57.125	57	....	57.125	57.125	57.25	57.125	57.125	57.25	57.375
Platinum $/oz. Troy Duty Free	76.50	76.50	76.50	76.50	....	76.50	76.50	76.50	76.50	76.50	76.50	76.50

*Holiday.

	18	19	20	23	24	25	26	27	30	High	Low	Aver.
Copper c/lb. Duty Free.												
Lake (Delivered)	14.25	14.25	14.25	14.25	14.25	14.25	14.375	14.375	14.375	14.375	14.25	14.281
Electrolytic (f. a. s. N. Y.)	14.35	14.35	14.35	14.35	14.35	14.35	14.35	14.35	14.35	14.35	14.35	14.35
Casting (f. o. b. Ref.)	13.90	13.90	13.90	13.90	13.90	13.95	13.95	13.95	13.95	13.95	13.80	13.905
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	5.75	5.75	5.775	5.80	5.825	5.80	5.80	5.80	5.825	5.825	5.725	5.768
Brass Special	5.80	5.80	5.825	5.85	5.875	5.85	5.85	5.85	5.875	5.875	5.775	5.818
Tin (f. o. b. N. Y.) c/lb. Duty Free												
Straits	52.50	52.125	52.125	51.875	52.625	52.25	51.875	52.125	51.125	53.875	51.125	52.363
Pig 99%	52.00	51.625	51.625	51.50	52.125	51.875	51.50	51.75	50.75	53.25	50.75	51.931
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.05	6.00	6.013
Aluminum c/lb. Duty 5c/lb.	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30	24.30
Nickel c/lb. Duty 3c/lb												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	37	37	37	37	37	37	37	37	37	37	37	37
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	10.25	10.125	10.25	10.125	10.125	10.125	10.125	10.125	10.25	10.25	9.50	9.963
Silver c/oz. Troy Duty Free	57.50	57.50	57.375	57.625	57.75	57.625	57.625	5.8	58.50	58.50	57.00	57.466
Platinum $/oz. Troy Duty Free	76.50	76.50	76.50	76.50	76.50	76.50	76.50	76.50	76.50	76.50	76.50	76.50

Metal Prices, May 3, 1928

NEW METALS

Copper: Lake, 14.37½. Electrolytic, 14.25. Casting, 13.95.
Zinc: Prime Western, 5.875. Brass Special, 5.925.
Tin: Straits, 51.875. Pig, 99%, 51.00.
Lead: 6.00. **Aluminum,** 24.30. **Antimony,** 10.50.
Nickel: Ingot, 35. Shot, 36. Elec. 37. Pellets, 40.
Quicksilver: flask, 75 lbs. $123.50. **Bismuth,** $2.10.
Cadmium, 75. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 58.375.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $76.50.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	10 to11
Brass Ingots Red	12 to13½
Bronze Ingots	12½to16
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	24 to40
Manganese Bronze Ingots	12½to16½
Manganese Bronze Forging	32 to40
Manganese Copper, 30%	25 to35
Monel Metal Shot	28
Monel Metal Blocks	28
Parsons Manganese Bronze Ingots	16½to19¾
Phosphor Bronze	14 to15
Phosphor Copper, guaranteed 15%	18 to21
Phosphor Copper, guaranteed 10%	17 to20
Phosphor Tin, guaranteed 5%	75 to80
Phosphor Tin, no guarantee	60 to70
Silicon Copper, 10%....according to quantity....	28 to32

OLD METALS

Buying Prices		Selling Prices
12¼to12¾	Heavy Cut Copper	13¾to14
12 to12½	Copper Wire	13 to13¼
10 to10½	Light Copper	11¾to12¼
10 to10¼	Heavy Machine Composition	11 to11⅛
7¾to 8	Heavy Brass	9¼to 9⅛
6½to 6¾	Light Brass	8 to 8¼
7¾to 8	No. 1 Yellow Brass Turnings	9¼to 9¾
9¼to 9½	No. 1 Composition Turnings	10¾to11
5⅛to 5¾	Heavy Lead	6¾to 7
3½to 3¾	Zinc Scrap	4¼to 5¼
8 to10	Scrap Aluminum Turnings	12½to14¼
13 to13½	Scrap Aluminum, cast alloyed	17⅛to18½
19 to20	Scrap Aluminum, sheet (new)	22 to22½
35 to37	No. 1 Pewter	41½to43½
11½	Old Nickel Anodes	13½
17½	Old Nickel	19½

Wrought Metals and Alloys

COPPER SHEET

Mill shipment (hot rolled)	23c. to 24c. net base
From Stock	24c. to 25c. net base

BARE COPPER WIRE

16c. to 16¼c., net base, in carload lots.

COPPER SEAMLESS TUBING

24½c. to 25½c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	21½c. net base
100 lbs. to 200 lbs. in one order	22c. net base

ZINC SHEET

Duty sheet, 15%	Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount	9.00 net base
Casks, jobbers' price	9.50 net base
Open casks, jobbers' price	10.00 to 10.25 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price	33.30c.-36.50c.
Aluminum coals, 24 ga., base price	31.00c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods	53c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 58¾c. to 60¾c. per ounce, Troy.

BRASS MATERIAL—MILL SHIPMENTS

In effect December 2, 1927
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.18¾	$0.20¼	$0.22¼
Wire	.19¼	.20¾	.22¾
Rod	.16½	.21	.23
Brazed tubing	.26¾	....	.32
Open seam tubing	.26¾	....	.32
Angles and channels	.29¾	....	.35

For less than 5,000 lbs. add 1c. per lb. to above prices.

BRASS SEAMLESS TUBING

23⅝c. to 24⅝c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	20¾c. net base
Muntz or Yellow Metal Sheathing (14"x48")	18¾c. net base
Muntz or Yellow Rectangular sheet other Sheathing	19¾c. net base
Muntz or Yellow Metal Rod	16¾c. net base

Above are for 100 lbs. or more in one order

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	26½c.	10% Quality	29½c.
15% Quality	28 c.	15% Quality	33¼c.
18% Quality	29¼c.	18% Quality	36½c.

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin. price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Supply Prices, May 3, 1928

ANODES

Copper: Cast	21	c. per lb.
Rolled	19⅜	c. per lb.
Electrolytic	18¼	c. per lb.
Brass: Cast	20	c. per lb.
Rolled	19⅞	c. per lb.
Zinc: Cast	12	c. per lb.

Nickel: 90-92%	45	c. per lb.
95-97%	47	c. per lb.
99%	49	c. per lb.

Silver: Rolled silver anodes .999 fine are quoted from 60¾ to 62¾c., Troy ounce, depending upon quantity purchased.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb	$2.75/lb.	$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$30.35
14" 20 ply 64/68 Unbleached	39.05
12" 20 ply 80/92 Unbleached	31.85
14" 20 ply 80/92 Unbleached	43.20
12" 20 ply 84/92 Unbleached	42.50
14" 20 ply 84/92 Unbleached	57.60
12" 20 ply 80/84 Unbleached	38.35
14" 20 ply 80/84 Unbleached	52.00
Sewed Pieced Buffs, per lb., bleached	.45-.70

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.11-.17
Acid—Boric (Boracic) Crystals	lb.	.12
Chromic, 75 and 125 lb. drums	lb.	.24-.25
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.17¾-.22¼
Denatured, bbls.	gal.	.47-.59
Alum—Lump, Barrels	lb.	.03¼
Powdered, Barrels	lb.	.042
Aluminum sulphate, commercial tech	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—Sulphate, tech., bbls	lb.	.03¾
Sulphocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.28
Chromic Sulphate	lb.	.37
Copper—Acetate (Verdigris)	lb.	.37
Carbonate, bbls.	lb.	.16-.17
Cyanide (100 lb. kegs)	lb.	.50
Sulphate, bbls.	lb.	.05¾
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¾
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry, bbls.	lb.	.29
Chloride, bbls.	lb.	.17-.18
Salts, single, 300 lb. bbls.	lb.	.10½
Salts, double, 425 lb. bbls.	lb.	.10
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09¾
Potassium Bichromate, casks (crystals)	lb.	.08½-.09
Carbonate, 96-98%	lb.	.07-.07½
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.05½
Silver Chloride, dry, 100 oz. lots	oz.	.45¾-.50½
Cyanide (fluctuating)	oz.	.51-.60
Nitrate, 100 ounce lots	oz.	.39½-.41½
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.19
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¼
Phosphate, tech., bbls.	lb.	.03¼
Silicate (Water Glass), bbls.	lb.	.02
Sulpho Cyanide	lb.	.42½-.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.39½-.40½
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11-.12
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03¼